Established 1916 as
OIL WEEKLY

# WORLD OIL

## Canadian Issue

SPECIALIZED FOR EXPLORATION, DRILLING, PRODUCING,
PIPE LINE OPERATIONS AND MANAGEMENT

DECEMBER, 1953

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## Christmas tour

Lights will be burning on thousands of drilling rigs this Christmas. Once the drill starts "turning to the right" it is seldom stopped for the holidays. That is the accepted tradition of this 'round-the-clock, 'round-the-year industry.

As the year draws to a close, the rotary drilling industry will have set a new record for the total footage and number of wells drilled in a given year. Made without fanfare, this record stems from the increased skill of drilling crews, the development and improvement of new drilling techniques and tools.

At this Christmas time Hughes Tool Company salutes the entire industry for its achievements of 1953.

# Those Not-So-Small Details

● Placing the measuring line over the sheave is one of the small details that mean a lot in a safe, successful cementing job. There are many parallels in producing cements to meet the wide range of conditions encountered in the oil fields today.

One of these is the ritual of cleaning and checking laboratory apparatus before each test. Every detail counts, in controlling quality to assure dependable performance, even under the highest pressures and temperatures in deep, hot wells.

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# WORLD OIL

Established 1916 as The OIL WEEKLY

Vol. 137, No. 7

December, 1953



## CURRENT OUTLOOK SECTION

Looking Ahead ... 55
Editor's Page ... Warren L. Baker 57
How Are Your Press Relations? ... Al Reese 58
The Courts Say ... Joseph M. Shelton 61
What's the Oil Industry Afraid Of? ... 62
Management Important in Securing Loans ... Eugene McElvaney 64
Why Is Taiwan Drawing Interest? ... 66
The Man Who Wasn't Blown Up ... Al Reese 68
The Big Moment . . . for M. L. (Mike) Benedum ... 75
Changing Panorama ... 76
Report from Observatory ... Ray L. Dudley and Warren L. Baker 80
Petroleum Trends in U. S. ... Cecil W. Smith 82
News Analysis ... 84
The Month's Completions ... 90

## EXPLORATION SECTION

Accessibility Surveys Cut Costs ... P. H. Blanchet, B. Kavanagh and F. E. Prebble 93
Surface Minerals Reveal Michigan Structures ... Bernard H. Lasky 100
Exploratory Drilling Rates Remain High ... Cecil W. Smith 109
U. S. Discoveries in October ... 110

## DRILLING SECTION

Casing Can Be Cemented in Permafrost Area ... Lt. Col. Foster L. White 119
Power Transmission on Rotary Rigs (Part 2) ... M. L. Rizzone 124
New Well Logging Developments (Part 1) ... L. A. Puzin 134
Pullback Device Making Derrickman's Job Easier ... 144
WORLD OIL Graphics: Swivel Care ... 151
What Are the Problems in the Delaware Basin? ... Philip L. McLaughlin 152
How to Do It—Drilling Hints ... 158

## PRODUCTION SECTION

Gravity Injection Pays Dividends at Redwater ... E. Hochhausen and I. M. Rice 173
How to Select the Best Decline Curve ... D. E. Menzie 180
Proper Gas Control in Pumping Wells ... Kenneth N. Mills 188
Materials Control Can Save You Money ... J. Tillman Ussery 198
How to Do It—Production Hints ... 206

## PIPE LINE SECTION

How a Pictorial Index Can Save You Time ... B. G. Sauthoff 225
'Darndest Pipe Line' Ever Constructed ... 226
Map of the Month: Union Oil Company of California ... 230
Perils of Pipe Line Pete ... 240
Pipe Line Construction ... Mary Stuart Warren 243
How to Do It—Pipe Line Hints ... 246

## INTERNATIONAL SECTION

1953 a Fruitful Year for Canada ... Gilbert M. Wilson 253
New Grid System Drafted to Speed Exploration ... Dr. Arthur B. Irwin 262
When the Ice Cometh, Man! ... 268
Will Saskatchewan Discover Its Own Leduc? ... F. H. Edmunds 270
'Weathered-In' Lease Problem Being Whipped ... M. R. Taylor 276
Lower Cretaceous in Alberta and Saskatchewan ... A. W. Formilo 282
What's Happening Among World Oil Men ... 292
A World of Oil ... Don Kliewer 294

## NEW EQUIPMENT SECTION

For More Information on Products Advertised ... 301
Reader Service Postcards ... 301
New Equipment ... 303
Other New Equipment ... 306
New Catalogs and Equipment Literature ... 310
New Catalogs and Equipment Literature in Advertisements ... 312

## DEPARTMENTS

Advertisers' Index ... 6
Who's Meeting Where ... 52
Men in Industry ... 314
Companies in the News ... 322
What's Happening Among Industry Associations ... 324
What's Happening Among Service and Supply Men ... 329
Trading Post ... 342
New Books, Maps and Movies ... 345
Squeaks from the Bullwheel ... 346


# A Quick Look at This Issue

BUSY OIL MEN: To help you put first things first, scan these time-saving digests on this and the following pages, checking ☐ those you want to read first.

### CURRENT OUTLOOK

☐ **There is no excuse** for anyone in the oil business not being fully apprised at all times of changes in the industry's supply-demand relationship, says Editor Warren L. Baker. The industry is blessed with exceptionally fine statistical information, he points out. But Editor Baker suggests that the industry is not using this valuable information to its best advantage. See Page 57.

☐ **How are your press relations?** Newspaper oil editors say there is a lingering gulf between them and the public relations men. WORLD OIL asked some of the industry's experts how that gulf can be bridged. Turn to Page 58 for their replies.

**Turn the Page**

## A Quick Look . . .

☐ **What is the oil industry afraid of?** One highly-placed executive looks at the production and reserves records which are being broken right and left and wonders what's wrong with going from peak to peak. See **Page 62.**

☐ **Borrowing money from a bank** to develop oil property is not just convincing the lender you have so many barrels of oil in the ground. You must also convince the banker that the property is managed properly. And he must be able to see a proposed loan as sound in the light of possible future changes in economic conditions. Some producers with good collateral have wondered why they have been turned down. Here's an article that furnishes the possible answers. **Page 64.**

☐ **Why is Taiwan drawing interest?** Recent reconnaissance indicates the island (Formosa) may have greater oil-producing possibilities than have been shown by the meager drilling done to date, mostly by the Japanese prior to World War II. Miocene and Pliocene sediments are believed to underlie the western plains portion of the island since the entire area appears to be the eastern end of a large sedimentary basin—possibly much larger than the Los Angeles Basin in California. See **Page 66.**

☐ **Some lost their shirts** on Oct. 29, 1929. Here's a man who lost his pants the same day—blown off by 3050 quarts of nitroglycerin. Turn to **Page 68** and meet Ed Donaldson, who at 81 is one of the last of the old-time shooters who took a daily stroll with death—and maybe they didn't come back.

### EXPLORATION ARTICLES

☐ **A baffling problem** has been confronted in the search for subsurface structures beneath the thick glacial drift of the Michigan Basin. The covering has frustrated geophysicists, required expensive core drilling, random wildcatting. Now a new geochemical method of exploration promises to spur discoveries in the area. See **Page 100.**

### DRILLING ARTICLES

☐ **Drilling equipment is going modern.** Contractors may select friction, fluid or electromagnetic type drives. This second part of a two-part article describes the advantages of each and presents charts and graphs explaining operating performance. For an article that simplifies the internal power transmission systems of modern drilling equipment, turn to **Page 124.**

☐ **Recent Logging Developments.** It is contended that the stratigraphic logging, and to some extent the fluid content determination of thick beds, can now be solved. Now we are thinking of inches instead of feet. Here's an article that tells where various logs work, and when to use them. Part 1 starts on **Page 134.**

☐ **A new pullback device** is saving rig time. This new device enables the derrickman to rack and latch onto drill collars of any size quickly and efficiently and without undue physical effort. It's made possible by an air hoist mounted in the derrick. Installation is compact, easy to set up, and eliminates the need of rigging up for drill collars. See **Page 144.**

☐ **The next frontier** for West Texas and New Mexico is the Delaware Basin. (October WORLD OIL, Page 142). What are the problems in the Basin? Drilling Editor Philip L. McLaughlin asked some experts. For their answers, turn to **Page 152.**

### PRODUCTION ARTICLES

☐ **You don't need a crystal ball** to tell you how long and how much oil a lease will produce under water-flooding or gas injection. Extend a straight-line decline curve, or extrapolate to zero rate. The difficult part of this procedure is selecting the right type of decline curve which forms a straight line. For descriptions of several types, how they are plotted, and their mathematical equations, read *How to Select the Best Decline Curve,* **Page 180.**

☐ **Want more efficiency for your pumping wells?** Then take another look at the gas problem. Gas is the most common cause for low pump efficiency in sucker rod pumping. An analysis of these problems, how to select the proper type pump for existing well conditions, and the various methods now used for gas control are presented in an article beginning on **Page 188.**

☐ **To realize maximum profit** from his investment, the oil producer must not only keep track of how many barrels of oil he produces, but how the equipment that produces the oil is used and where it is located. This can be done by an efficient materials control program. For how this is done and how it can save YOU money, see **Page 198.**

**A Quick Look . . .**

# *Canadian articles in this issue . . .*

☐ **Canada's search for oil** has raced into the muskeg, the dense forests and the rugged river country. All of which present formidable obstacles to exploration crews. However, many of the resulting problems of accessibility have been resolved by accessibility surveys consisting basically of the stereoscopic analysis of aerial photographs by competent photogrammetrists. See (Exploration Section) **Page 93.**

☐ **Frozen ground is a big problem** in completing Canadian wells. Pipe can not be cemented successfully because the cement slurry will freeze before a set condition is reached. Now adulterants are used to accelerate the setting time ahead of freezing. For a discussion on this subject, turn to (Drilling Section) **Page 119.**

☐ **Canada's Redwater Field** faced many problems in laying out a gravity flow system for disposal of waste water. But they were solved by the erection of the country's largest system which ultimately will serve the field's 900 wells. See (Production Section) **Page 173.**

☐ **It's the same old problem** as Western Canada looks to the end of 1953—lack of adequate market outlets. But despite that, reserves and crude producing capacity are climbing to an all-time high. This and other "soft" spots paint a picture spotted with pessimism; however, many feel the difficulty is only temporary. A well-rounded summary of Canada today and the highlights of 1953 begins on **Page 253.**

- While Alberta's completion rate is down from a year ago, number of rigs active and total oil wells capable of producing are up from 1952. **Page 255.**

- The Westerose-Homeglen-Rimbey region, southwest of Edmonton, reported new finds during the year. Activity was highlighted by several significant stepout discoveries. **Page 256.**

- Continued expansion and infill-development continued during 1953 in the Viking Sand trend southeast of Edmonton. **Page 256.**

**TALL TIMBER** of British Columbia provided some problems for engineers and construction crews working on Trans Mountain Oil Pipe Line running from Edmonton, Alberta, to Vancouver, B. C. All timber on right-of-way had to be valued by independent cruisers, removed from 60-foot right-of-way, then disposed of to the satisfaction of all. Then there was the ever present fire hazard, a big worry during the dry season in the Cascades where this picture was taken. For more about Trans Mountain line, see **Page 259.**

- Saskatchewan drilling activity reached an all-time high in August, 1953. The Canadian Petroleum Association says that during the first six months of 1953 the province showed a 59 percent rise in production, 55 percent increase in all wells drilled, and 72 percent upturn in footage drilled, as compared with the same period of 1952. **Page 258.**

- Manitoba production reached a high of 56,490 barrels, most of which was produced by about 56 wells in the Daly field, the province's largest. Production from this field has climbed because the Interprovincial Pipe Line has been made available as an outlet. **Page 258.**

- British Columbia activity maintained a steady pace during the year. Efforts were confined principally to

***In this issue . . . your map of oil, gas fields, pipe lines of Western Canada***

## A QUICK LOOK . . .

exploration designed to expand and evaluate the huge Fort St. John gas field and surrounding areas. **Page 259.**

- Highlight of Western Canadian pipe line activity during 1953 was the completion of the 718-mile, 24-inch, $93 million Trans Mountain Oil Pipe Line between Edmonton and Vancouver, B. C. **Page 259.**

☐ **Incentive for Exploration**—Remoteness and high transportation costs are obstacles confronting exploration in the Northwest Territories and Yukon Territory. However, new and liberal regulations tend to offset disadvantages and offer incentive for continuing petroleum pioneering. **Page 262.**

☐ **It's cold in Canada** from November to March. But drilling operations continue the year 'round, even when the temperature drops to 30 to 40 below zero. This makes it difficult on both men and equipment, as you can see on **Page 268.**

☐ **Suspense in Saskatchewan**—will this province have its own "Leduc"? An air of optimism continues despite a feeling of disappointment among geologists that exploration has not yielded the hoped-for results. If and when a large field is discovered in this province, it could come from one of four horizons. Turn to **Page 270.**

☐ **Operating weathered-in leases** in the land of the big snow is a long-standing problem in Canada. But a test being conducted on one Alberta lease shows that automatic operation of flowing wells and tank battery, a procedure new to Canada, is "worth its weight in oil." **See Page 276.**

☐ **Western Canada's Lower Cretaceous horizon** is growing in importance as a source of important crude reserves. Small companies are viewing it with increasing interest for three big reasons. See article on **Page 282.**

### PIPE LINE ARTICLES

☐ **Give up?** Have you ever searched long and hard for a picture or drawing you could never find? Well one company is proving that pictures have their place in the pipe line industry by installing a small loose-leaf style pictorial index. Here the locations of the larger drawings are easily indexed. See **Page 225.**

☐ **Any way you look at it,** it's *The Darndest Pipe Line Ever Constructed.* It's a gas line where the flow is toward the high-pressure end of the line. In places it's at an elevation of almost two miles and one grade is just 12 degrees from vertical. It crosses mountains and marshes. And it's only 63 miles long. Turn to **Page 226.**

☐ **From 40 miles in 1886 . . .** to 1183 miles today. That in part is the story of Union Oil Company of California's pipe line network. The company's three systems date back to the world's first crude pipe line from producing wells to tidewater. For story, pictures and map, see **Page 230.**

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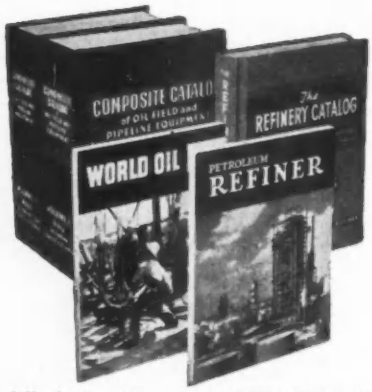


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**PETROLEUM REFINER** and **THE REFINERY CATALOG** for the refining-natural gasoline-petrochemical industry.

RAY L. DUDLEY, President, Publisher
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*Indexed by Industrial Arts Index and Engineering Index*

# Looking Ahead . . .

. . . **A general business decline** in 1954 of not more than 5 percent. That's the consensus of the Business Advisory Council, composed of 160 industry executives, which reports to the Secretary of Commerce. That would make 1954 the second most prosperous year, surpassed only by 1953.

. . . **Tax cuts on January 1** will be limited mostly to the 10 percent reduction on individual incomes and elimination of the excess profits tax. Continuance of excise taxes will be sought, along with retention of 52 percent corporate income tax instead of dropping it back to 47 percent as previously scheduled.

. . . **Adequate steel supplies for drilling needs** are indicated for 1954, assuming about same drilling rate as in 1953. Production of oil country steel goods will be raised to about 2.4 million tons in 1954 from 2 million in 1953. This output of steel goods should permit drilling of 48,000 wells without difficulty.

. . . **A completely interchangeable substitute for natural gas,** made from natural gasoline, may be available in 1954 or early 1955, according to Capt. E. S. Pettyjohn, of Illinois Institute of Technology. By a new process of pressure hydrogasification, a conversion to gas has been accomplished for the first time without a solid or liquid residue remaining. The substitute is needed, he said, in meeting seasonal peaks of demand for natural gas.

. . . **Possibilities of oil in Arkansas Valley** of West Central Arkansas, where heretofore only natural gas has been produced, is arousing new interest. The interest has been generated by recent success in adjacent northern Mississippi, where oil is now being produced from Knox dolomite. Arkansas Valley is geologically similar to the northern Mississippi area.

. . . **So-called guaranteed annual wage** will be actively sought by labor unions in 1954 and 1955 in steel and automobile industries and eventually probably will be demanded in petroleum and other industries. Under some proposed plans, employer would establish a trust fund of 10 cents per man per hour. After three years of employment, a worker dropped from the payroll would receive a substantial percentage of his regular weekly pay for 52 weeks, paid out of the trust fund. The employer's liability would be limited to the amount of the trust fund. Unions may propose that payments received from the fund by a laid off worker be reduced by the amount of unemployment compensation he receives from the state.

. . . **World use of petroleum would be greatly increased** if other countries followed U. S. example of replacing steam railway locomotives with diesel electrics. American railroads are making large savings with the diesels. By dieselizing, one leading U. S. railroad cut costs of operating and maintaining its locomotives one third, from $9.6 million to $6.4 million annually.

. . . **Atomic energy won't displace oil, gas, coal, or hydroelectric systems** as sources of power unless costs are sharply reduced. Nuclear power will meet rough competition from oil, gas, and coal for several decades at least, and may never propel automobiles or airplanes because of lethal radiation. It probably will never be competitive with hydroelectric power, because water comes free and uranium does not. However, radioactive materials already are finding numerous practical non-power uses, including many in the petroleum industry. They trace movement of oil through pipe lines, in refineries, and in the oil producing reservoirs, and reveal porosity and other characteristics of formations penetrated by wells.

# Westinghouse pneumatic system controls

# biggest barge rig on Gulf Coast!

**THE *BLIND PASS*, RICHARDSON AND BASS COMPANY'S BIG NEW DRILLING BARGE,** can handle any known or contemplated drilling job in the Gulf Coast area. It's equipped with a National Supply Company Ideal Type 160 Consolidated Rig, one of the largest made. The rig is driven by 5 Superior dual-fuel diesel engines that develop a total of 3350 hp. A Westinghouse Air Brake pneumatic control system makes the rig easy to operate.

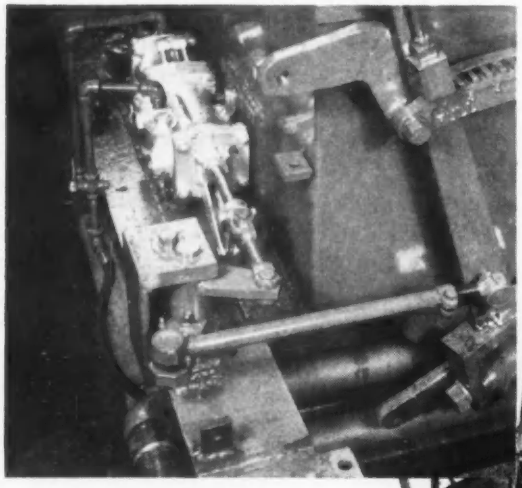
All controls are mounted on one compact control stand located in front of the driller. He always can see everything that's going on around the rig and just a few movements of his fingers adjust the engines just as he wants them. He even regulates the loading of the Gyrol Fluid Drive unit on each engine with pneumatic controls.

Westinghouse Pneudyne® Positioners are used to position the scoops in the Gyrols. Just by varying the air pressure supplied to these positioners, the driller can regulate the power flow from each engine individually.

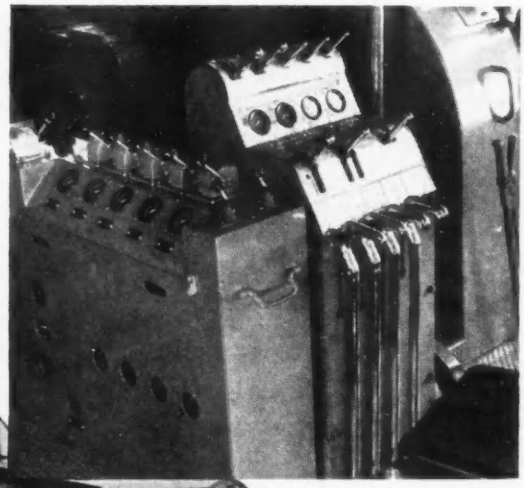
These Westinghouse pneumatic controls are reasonable in cost and require very little maintenance. They lower drilling costs by making rig operation easy and fast. They can do the same for *your* rig.

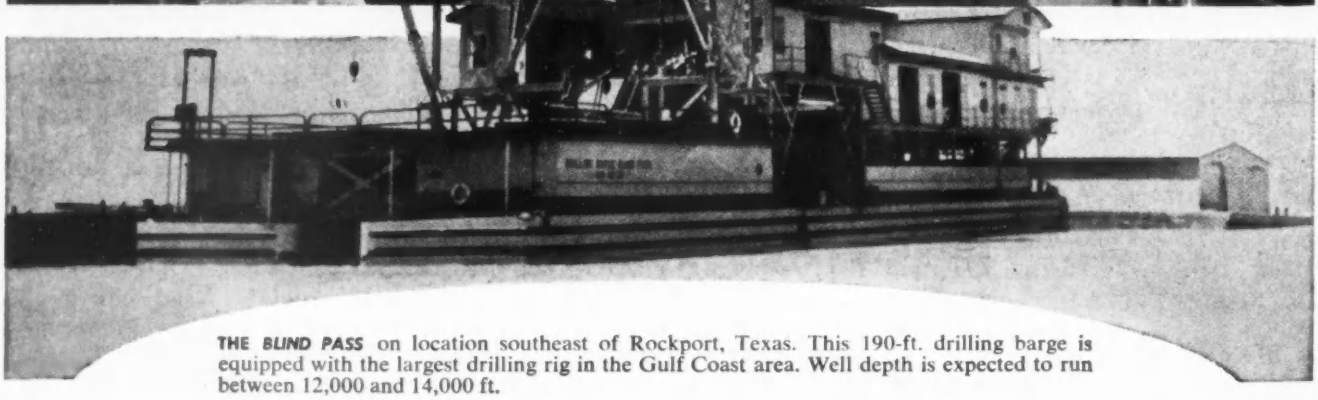
Westinghouse Air Brake
COMPANY
INDUSTRIAL PRODUCTS DIVISION WILMERDING, PENNA.

**A WESTINGHOUSE PNEUDYNE® POSITIONER,** mounted alongside the fluid drive unit on each engine, positions the scoops in the Gyrol. Position is controlled remotely from the driller's control stand.



**ALL CONTROLS** for the rig of the *Blind Pass* are centralized on this control stand. Just by moving a few finger-operated levers, the driller can control every engine operation. Westinghouse Air Brake pneumatic controls make the driller's job easier and speed up operations.





**THE *BLIND PASS*** on location southeast of Rockport, Texas. This 190-ft. drilling barge is equipped with the largest drilling rig in the Gulf Coast area. Well depth is expected to run between 12,000 and 14,000 ft.

# Better Use of Statistical Data

**There is no excuse** for anyone in the oil business not being fully appraised at all times of changes in the industry's supply-demand relationship. This is because petroleum is blessed with exceptionally fine statistical information which is widely circulated through many sources.

Few indeed are the industries which are as fortunate. Many must operate with incomplete information, much of which is outdated by the time it becomes available. Consequently, oil's remarkable statistical data are the envy of other industries.

Each week the industry is provided with reports giving crude production, refinery runs, stocks of crude oil and refined products, and refinery output of major refined products. These reports give current up-to-date information by districts or areas, usually less than five to seven days old at the most.

This information receives wide distribution. Numerous newspapers through the nation's various oil regions publish it weekly. The industry's magazines publish it regularly, many including analytical discussions of market trends as revealed by these statistics. These many sources make the information available to everyone.

•

**If more attention were paid** to the conditions revealed in these statistical reports, the industry could avoid many of its market ups and downs. Both producing and refining operations could be maintained at a more even keel throughout the year, if things were not permitted to get so far out of hand before taking action.

For example, the industry currently is troubled with excessive supply in the form of crude and refined product stocks. Statistical reports have shown too much crude was being produced and refined ever since late spring. Yet, the industry was slow in following the course dictated by its statistical trends. As a result of continued high operations, both crude oil and refined stocks became steadily more excessive. Consequently, it became necessary that drastic reductions be made in both producing and refining volumes during recent months. This is merely a case of the industry having to pay the penalty for not adhering more quickly to the course indicated by its fine statistical information.

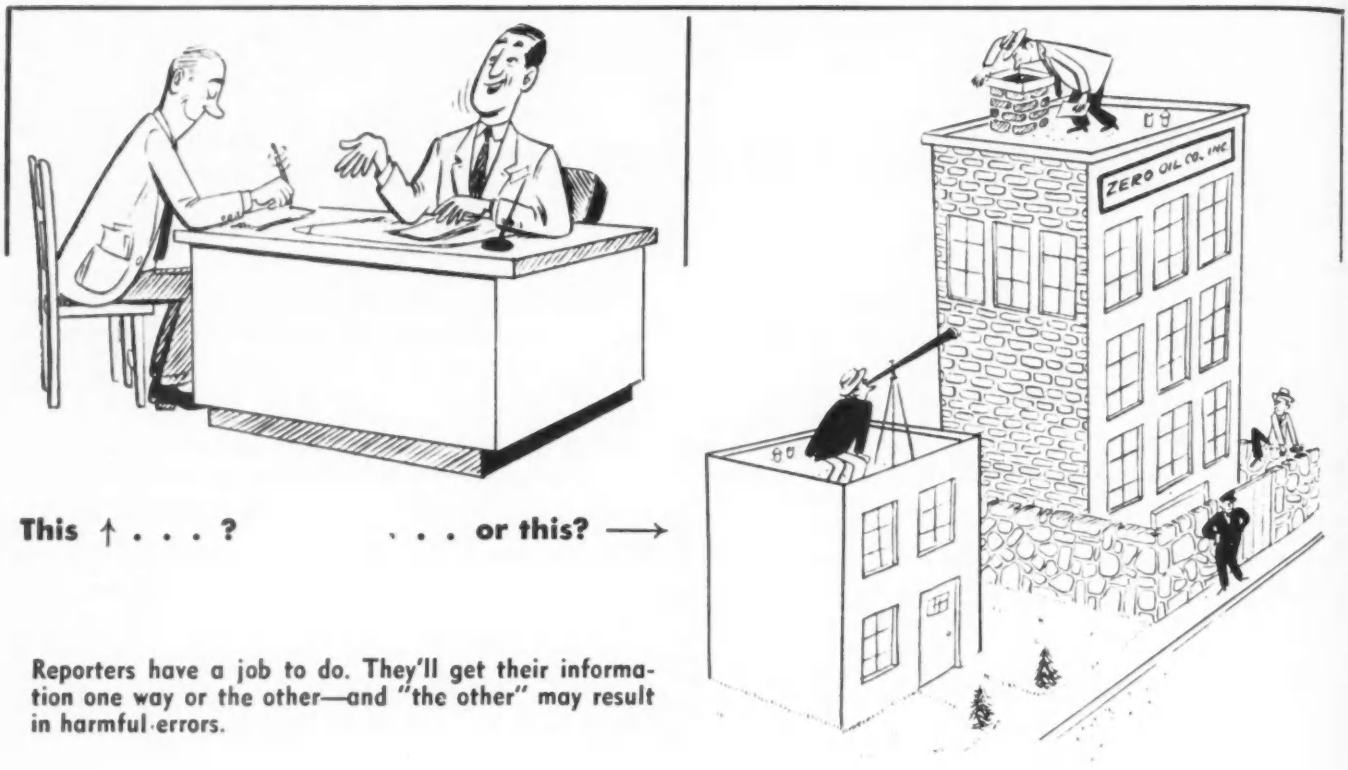
•

**These sharp ups and downs** in operating volumes could be avoided if closer attention was given to weekly reports on stocks, and the industry responded more quickly to indicated conditions. Oil is not taking full advantage of its superior statistical information.

This is a joint responsibility of producers, state conservation agencies, importers and refiners. All need to take a little longer range and more realistic view of market trends as revealed by the industry's statistics. All need to cooperate individually and collectively, and not leave the move entirely up to the other fellow.

If each did his part, oil's statistical information could be invaluable in freeing the industry from many of its sudden changes in market conditions. Everyone would be better off if operations were geared more closely to available statistical information.

Warren L. Baker




**This ↑ . . . ?** **. . . or this? ⟶**

**Reporters have a job to do. They'll get their information one way or the other—and "the other" may result in harmful errors.**

# How Are Your Press Relations?

**Is there a gulf between you and the newspaper editors? Here is some expert opinion on how you can bridge it.**

**By AL REESE,** WORLD OIL Staff

"APPARENTLY THERE is still a gulf to be bridged between the men who write and edit the oil pages of newspapers and the men or groups who handle public relations for companies and the industry."

This statement appeared—and has been repeatedly paraphrased—in the *APW Bulletin,* published by the Association of Petroleum Writers, an organization of leading U. S. oil editors dedicated to improved news reporting.

The oft-noted gulf is as old as the first tight hole ever drilled, older than the first scout who wormed through the underbrush toward a rival's rig, and older than the refining industry's first laboratory secrets. In an industry in which secrecy was once held to be synonymous with survival, a lingering habit of reticence is but natural.

The gulf has been widened by instances of damagingly inept reporting.

Neither side claims to be blameless. One long-time public relations director whose position is such that he addresses vice presidents by their nicknames, told WORLD OIL:

"I do not know of any . . . executive who would consciously or intentionally withhold information from me that I should have, but most of the ones I know and work with are prone to forget sometimes, even on important stories. In most cases it's a matter of training, a matter of outlook, a result of innate conservatism, the big old human trait of playing safe when you're not sure. Some of it, however, is the result of failing to realize that you cannot expect favorable recognition in the press unless you are willing to cooperate with the press in furnishing legitimate news that may not be so favorable.

"Perhaps it should be added that there are a great many engineers and lawyers in the oil business, and in important positions. The watchword for these men in their daily work is accuracy and detail. Some of them are afraid of the press because to them segments of the press are neither accurate nor detailed. In working with some of these men, you and I must first become catalysts, then interpreters."

On the other side, an oil writer admitted in the *APW Bulletin:*

"For the most part the oil press . . . is pretty well versed on its subject and is able to present an intelligent and accurate account of what's going on in the oil industry. Opposed to that, however, is a total lack of understanding and accuracy in so many

oil stories handled by newspaper staffers with no knowledge of the oil industry. I say that advisedly, being a former city editor on a daily."

**Reporting Improved**—Recognition of the basic reasons for the lingering gulf between the press and the oil companies is a prerequisite to their dissolution. The standards of oil reporting are being raised through the efforts of the APW and through the acceptance by newspaper managing editors that the oil editor's desk cannot be capably filled by a superannuated reporter of city hall news. However, this acceptance has often come tardily, with the result that more talented reporters sometimes have difficulty in filling acceptably the greater space being devoted to petroleum activities.

Geared to the press' former indifference, some public relations departments have not quite caught up with the brisk postwar demand for information. This, in the main, consists of educating management to the heightened interest in company affairs and personalities. To this extent there is actually less of a chasm between oil editors and public relations men than between the latter and management. "Why," is the often heard puzzlement from on high, "do those fellows want to write about ME?"

But, on the whole, the industry has accepted to some degree that good press relations are essential to a sound program of public relations. This acceptance is taking place by two methods—evolution and revolution. Evolution results largely from the persistence of public relations men; revolution results from the mandate of enlightened management.

Most spectacular of the revolutionary contributions have been made principally by comparatively new firms—notably the gas transmission companies. Veteran public relations men who have spent years in gently rending the veil from their managements' activities are standing in slack-jawed astonishment as their cohorts open shop with neatly packaged programs, embossed in gold by a management unschooled in taciturnity.

Many another revolution has taken place in older companies under the guidance of men who think like Reese H. Taylor, president of Union Oil Company of California. Here, in Taylor's words, is the press relations creed that Union lives by:

". . . aside from trade secrets, what a company feels it can or cannot explain to its employes, its customers, its stockholders and the public in general is a pretty good indication of how well it is being run. It takes more than money and material to make good products. Without an interested and informed public—customers,

## *Do's and Dont's of Press Relations*

Here are some tips on good press relations from some of the top public relations men in the industry.

**DO—**

Know your newspapermen. Regardless of the community's size, it should be natural and easy for you to develop and maintain contacts with newspapermen.

Know your authority. Your authority in press relations goes just so far as the scope of your responsibility and authority in your own operation.

Watch your timing. A release for an afternoon paper should be in the hands of the city editor by 9 a.m. To make all editions of a morning paper, a story should be at the newspaper the afternoon before, not later than 6 p.m.

Respect the reporter's time. Give him the information he wants as quickly as possible.

Make available names and phone numbers of press relations people who can be called after office hours.

Send personal letters with release from time to time.

Address the editor by name, and be sure it is the correct one.

Everything you can to improve public understanding of the legitimate role or function of business in a democracy.

**DON'T—**

Give out information unless you are certain it's correct.

Make statements concerning company policy unless you know the statement is authorized and that it agrees with policy.

Give out information that may tip off competition or injure customers or employes.

Play favorites with newspapers.

Try to get a story in the newspaper just because your company happens to be a good advertiser.

Ask to see a story before it's printed.

Scold, threaten, use trickery or pressure on newspapers.

Thank an editor for running a story. He likes to think he printed it because it was news. Complimenting a reporter is fine, however.

Flood the newspapers and magazines with trivial stories.

Over-do a story in your enthusiasm to get it printed.

Violate a reporter's confidence. If he comes up with an exclusive story and asks for confirmation on it, respect his initiative and do not make a general release of it.

Be evasive. If a question can't be answered for policy reasons or the facts are not ready at the time, don't fail to tell the inquirer so.

Think of all publications, nor of all writers and reporters, as a single group. There are variations which are just as broad as are found in the ministry, finance, science or business.

Fail to remember that business is a democratic institution, which exists in the American economy through the sufferance of the people. It cannot live in an atmosphere of misunderstanding.

shareholders, dealers and employes alike—there would be no Union Oil Company of California."

When the top man of every oil firm echoes these words with sufficient force to make them a real, working policy, the gulf between management and the PR men will seal, leaving only the narrowing gap between the latter and the oil editors. This consists mainly of the mechanics of news distribution. It can be, and is being, bridged by an understanding among the public relations men of what the press wants, and an acceptance by the oil editors of how much the PR men can reveal and how much they can humanly be expected to do.

A frequent complaint among oil editors is that the PR men don't send out enough news of significant developments and seldom turn out bright features.

**New Concept**—This criticism ignores the changing concept of press relations. As the companies grow in personnel and physical facilities, thereby becoming richer sources of information for a press becoming ever more receptive to news of petroleum activities; and as management places fewer taboos upon information which may be publicized, the burden of the PR man grows heavier.

"We simply don't have the time," said a major company representative, "to be a handout bureau for trade papers, miscellaneous publications, and the daily press. And if we did, it would be an impossible job because of the necessity of slanting every story according to the geographical interests of each paper and the policies of each managing editor. The only solution is for us to act as an information center. We will dig up the answers to any reasonable question, but we simply can't write reams of stories."

Said another PR director: "... it is essential that a public relations department cooperate with press representatives and give them in every way possible the information they seek.

"One basic tenet of ours is to release only stories that are actually newsworthy."

And another: "... we maintain a press contact service where the press can secure information promptly about our corporation activities, and any information about the oil industry generally which they might need. We try to be friendly and readily available.

"In cases where we know that any of our activities are newsworthy, we prepare news releases and send them out to those who will find the information useful."

And another: "We confine our releases to items which we feel have both news value and reader interest. In addition, we cooperate with the press by answering inquiries as fully and as promptly as possible."

More emphasis is placed on news handouts during such occasions as Oil Progress Week. These observanes also call for special services. For instance, it is the policy of Standard Oil Company of California, as part of its participation in Oil Progress Week, to fly newspapermen from outlying points to its refineries. "We try to get as many as we can of the editors or staff members of the smaller papers, because they are overlooked so frequently in affairs of this kind." This year, California Standard planned to bring about 40 Washington and Oregon press and radio representatives to the Richmond refinery, and another 20 from eastern Washington and Idaho to the Salt Lake refinery.

**Disaster Procedures**—Intense and unusual efforts are also made in the aftermath of an explosion, fire, or the like. Such an emergency sets off a fury of defensive activity—defensive because the industry realizes that reporters have a job to do, and frequently it's up to the company involved whether they do the job right or foul their front pages with harmful exaggerations.

Every PR man knows this. Said one: "... industrial accidents and injuries are items of legitimate news value, and as such should not be suppressed. It is a newspaper man's job to report the news and, like anyone else who is conscientious about his work, he will use whatever legitimate means are available to get his job done. In case of an accident he will go to the logical source, but if he can't get the information he wants there he will get it some place else. In the case of our company we want to give him the information ourselves."

Some companies have learned this lesson only after considerable pain. One PR man recalled that "Another oil company in this area had a disaster and as a result of what appeared to be a rather unfortunate attitude toward the press, one might say that the company came out second best in the reporting. I do not mean to imply that the reporting was purposely slanted, but the men assigned to the story could not get all of the facts and as a result had to write their stories on the few facts they could dig up. This resulted in some unfortunate deductions on the part of the readers.

"Our manufacturing men realized the shortcomings of such a situation and determined to devise a 'disaster' procedure."

Many formal disaster procedures in the industry are similar to Union Oil's, which points out that "The reporter comes to you for one reason—to get the story. Give him all the facts you can, unhesitatingly and accurately. If you can't answer his questions, admit you don't know. We want the press to know that Union Oil will supply them with uncolored, genuine news as clearly and as quickly as it knows how.

"Cause of the Emergency? Very possibly the cause is not definitely established. If it is not, don't guess and don't give out 'cause' information until it is definitely established. Tell the reporters frankly that as soon as all the facts are known they will be told. Then see that they are told. Do not suggest 'possible' causes, as often they prove later to be wrong.

"Estimate of Damage? Give as accurate an estimate as possible, based on your knowledge of the operations and equipment. Some reporters under the emotional excitement and need for reporting the story rapidly may be apt to give an exaggerated estimate rather than a conservative one. Help them to report its closer relationship to actual facts.

"Casualties? A brief but accurate statement regarding any injured or dead persons should be willingly furnished the press. This is a situation

where correct names and initials and addresses (if possible) are of the utmost importance.

"LIABILITY? Is it wise to restrain comment on such matters. The liability of the company, if associated with a disaster, involves many legal and technical factors.

"PHOTOGRAPHS? Admit photographers to any scene they feel is newsworthy. Give them full cooperation. It is wise, however, to check the credentials of the photographers to be sure they are with recognized publications or news services."

**Fixing Responsibility**—Many large companies use generalized disaster procedures as a stop-gap measure pending the arrival at the trouble site of qualified spokesmen. One West Coast refinery has set up a list of employes authorized to aid press, radio and television during emergencies. Chosen because of their knowledge of the various installations, every man listed is equipped to give quick and correct information on (a) the nature of the emergency; (b) the cause of the emergency; (c) the extent of the damage and a conservative estimate of property loss; (d) the nature and extent of injuries to personnel; and (e) an estimate of the time required to restore normal operations.

Another company details for its employes the proper procedure for handling the press immediately after emergencies, then adds: "A member of the Public Relations staff will be sent to the scene of major emergencies as quickly as possible and he will directly assist the division manager or others in charge of coordinating the information required and releasing it."

Less spectacular but no less important than these emergency procedures are day-to-day press relations. These will succeed or fail to the degree that industry applied a creed which one PR man expressed like this:

"We believe the press has a right to know what we are doing and, as long as we do not give away a competitive advantage, we should supply the information they seek. If our 'good citizenship' is a fact and not just an idealistic wish of the management, this information should help us attain our basic objectives."—**The End.**

# The Courts Say . . .

## in recent insurance cases

Shelton

*This column is to inform—not advise. It presents the current trend in legal thinking on insurance cases. The law varies from state to state and its application depends upon the facts of the particular case. Do not attempt to apply it without consulting your attorney.*

**JOSEPH M. SHELTON,** Attorney at Law, Dallas

### That to save former defenses employer must show exemption from compensation act

EMPLOYE SUED EMPLOYER at common law for personal injuries received while riding in a truck driven by a fellow employe on mission for employer. Neither side mentioned whether or not employer was eligible to come under or was under the compensation act. The employer claimed the defense of contributory negligence on part of injured employe. The trial court would not allow the defense on the theory that it was abolished when the employer is eligible but doesn't choose to come under the act. The employer said the employe had the burden of showing that the employer was deprived of the defense.

**The Texas Supreme Court** said the employer had the burden of pleading and proving facts which showed him exempt from the provisions of the compensation act in order for him to retain the defenses which the act abolished.

*—Phipps v. Evans 259 S. W. 2d 723 (Tex. Sup. Ct., 1953)*

### That injuries of innocent bystander resulting from employes' fight were not compensable

L— FOUND A NICKEL on the floor of employer's premises. W— claimed the nickel. A quarrel ensued between them and L— shot and killed W—. During the shooting a stray bullet struck claimant who was in no way involved and was at all times at the proper place engaged in regular duties for employer. Compensation was denied.

**The court said** the quarrel between L— and W— was in no way connected with their employment. The injury must be a risk of the employment and have some direct relation to the details of the work itself. The mere fact that employment brought the offender and the victim together is not sufficient to supply the element of casual connection between the employment and the injury.

*—Long v. Schultz Shoe Co. 257 S. W. 2d 211 (Mo. Ct. of App.—St. Louis, 1953)*

### That death occurred from natural cause

EMPLOYE WAS HALF OF A TWO-MAN CREW stacking lumber. They had worked at about a normal pace during the day and as they walked to another load, employe who was carrying a 36-pound jack fell and died almost immediately. The diagnosis was coronary occlusion. One doctor testified he could have had the coronary at any time. The other said any unusual strain could aggravate the condition.

**The Arkansas court** said compensation is recoverable only when death or injury results from an accident. A worker whose death is perceptively hastened by reason of some unusual transaction—a transaction that might with reason be construed to be an accident—comes within the Act. However, compensation will not be paid where the work load was precisely what the employee had been engaged to carry and is not unreasonable.

*—Faust Bond Saw Mill v. Richardson, 253 S. W. 2d 213 (Ark. Sup. Ct., 1953)*

# What's the Oil Industry Afraid Of?

## An executive takes a look at the situation, cites continuing record years—and then wonders.

WHAT IS THE oil industry afraid of?

Pointing to continuing crude production and reserves records, John R. Suman, vice president, Standard Oil Company (N. J.), finds it hard to see any reasons for complaint about setting records.

That was said in an address, "Perspective on the World Oil Picture," before the American Petroleum Institute in Chicago last month.

In his analytical look at the oil industry, Suman said enlargement of oil industry facilities, especially since the war, throughout the world has been in response to the rapid growth of demand.

And he said that this expansion, of course, had affected the domestic oil business.

"This is quite natural. From its earliest days, the nature of our business has been such that a large new source of supply, or a large new area of demand, has always had pretty prompt impact upon the industry as a whole.

"We have seen this not only as between countries, but also as between different sections of the U. S. For example, discovery of East Texas affected Pennsylvania, Ohio, Illinois, Oklahoma, and other older producing areas of the nation. Today discoveries in Arabia or Alberta, or rising demand for liquid energy in the United Kingdom or North Africa, have their influence in Louisiana or Wyoming."

**Not Imports Alone.** Turning to an immediate cause for the current concern in the domestic producing industry—recent reductions in allowables—Suman said that placing the blame exclusively on imports is a "great over-simplification."

These other factors are involved, he said:

• It appears clear that production was over-enlarged late last year to make up for loss of output resulting from strikes in a number of refineries earlier in the year. "Some cutback," he explained, "from what can be regarded as an unnaturally high level was in order."

• The industry, whose volume is affected by weather, has been going through a period of abnormally high temperatures.

• There has been some slight slackening of general industrial activity in the U. S. since last spring. Of this factor, Suman said that "after years of rising output, such a letup is only to be expected." And he added that the oil industry cannot remain unaffected by the rate of activity in industry generally.

The Jersey executive referred to the present margin of productive capacity over current use of about a million barrels daily in pointing out that, to the extent that imports were reduced, the industry could begin digging into this spare reserve.

However, he cautioned against such a move.

"Any desire to begin getting a return on this capacity should be balanced against the fact that our government regards this production reserve as a very important security measure against the event of war or other serious emergency."

Discussing the paradox of industry pessimism and continuing records, he said:

"Despite the cutbacks made in several months of this year as against the immediately preceding months, domestic crude oil production for the year as a whole will average in the neighborhood of 6.5 million barrels daily. This is approximately 4 percent higher than in 1952, which was itself a record year.

"This means that crude production in 1953 will set a new high mark in the industry's entire history.

"It's hard to see why we ought to complain about setting a record."

To dispel the feeling that conditions are such that the search for new oil has been discouraged, he cited some figures.

"Well completions this year to date are up about 5½ percent. The number of wells drilling at the end of September this year was up 32 percent over those drilling at the end of September, 1952, and the year's total will probably be more than 47,000—a new record.

"The recent Paley Report," Suman continued, "estimates that U. S. consumption will rise to more than 13 million barrels a day by 1975 and predicts that the rest of the free world will be using a like amount, compared to the present daily total of about 5 million barrels."

Thus, the U. S. demand estimate seems likely, he added, to assure the domestic producer a constant and eager market for all the oil he can efficiently produce.

**True Picture.** In connection with the imports question, Suman said in order to get a true picture of their relation to the domestic producer it is necessary to consider particularly figures for Districts I to IV, since the West Coast has historically had its own special producing and importing conditions.

"When we do this," he said, "we find that the story is not one of 'floods' or 'torrents'."

He cited Bureau of Mines figures showing ratio of crude imports to domestic crude production of 10.8 percent in 1950. In 1951, due to the Iran shutdown, the ratio fell to 9.3 percent; last year it went up to 10.2 percent, and this year, he said it appears that the ratio will be about 10.3 percent.

"In other words, over the past four years fluctuation has been within a range of 1½ percentage points, and the ratio of crude imports to domestic production east of the Rockies is lower for 1953 than it was in 1950."

While the industry admittedly will not go on topping peaks forever, Suman said his only wonder is why one step down from perfection is felt to be alarming. —**The End.**

# *What!...*

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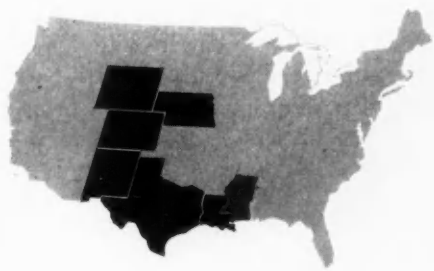

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**Here's a banker's view on financing of petroleum properties. He explains that . . . .**

# Management Important In Securing Loans

**By EUGENE McELVANEY,** Vice President
First National Bank in Dallas

PETROLEUM PROPERTY financing, while a relatively new banking function, has achieved, even with considerable variations, a fairly regular pattern of technique. On the other hand its association with factors of management has been too little emphasized, and both the oil industry and the banking profession should explore the very definite relation between the two.

In the evolutionary processes leading up to the present concept of petroleum property financing there has been a constant tendency to attempt the establishment of some fixed technical formula by which even a junior clerk having access to the magic figures might safely embark upon a full scale lending program. The question most frequently asked by potential oil borrowers is: "How much per barrel will you lend on oil in the ground?" If oil property financing could ever be reduced to that simple an approach, we could perhaps divorce the entire function from management and look to the engineer only for lease recovery estimates in terms of barrels.

The most important element of the whole oil lending background is the almost phenomenal advance in technology during the past 25 years, completely revolutionizing methods of exploration, drilling, production, refining, distribution and marketing of petroleum and its myriad products. Even more significant technological advances have been achieved in other aspects of petroleum development after its discovery in paying quantities. A glance through the advertising sections of our modern oil and gas publications is convincing evidence of what the enginering world has contributed in recent years to man's ceaseless search for oil.

If progress has been made in the methods of finding oil and converting it to the useful and needful purposes of mankind, an almost revolutionary concept of banking has at the same time kept pace with the technological progress of the industry itself. And so we see today the ready and even eager employment of millions of dollars of loanable bank and insurance funds in channels which a few years ago would have been rank speculation, if not downright foolhardiness.

Three principal developments have established oil in the ground as a bankable commodity:

1. The tremendous increase in the use of petroleum and its products during the last quarter century.

2. The inauguration and successful administration of regulatory statutes having to do with maximum efficient production and prevention of waste.

3. The engineering progress that enables the fairly accurate determination of producible underground reserves.

This third factor is the area wherein the author bases observations and discussion with respect to the relation between petroleum property finacing and management.

It is recognized at the outset that the petroleum engineer in the broader concept of his function has made possible the financing of petroleum properties. Particularly in the technical aspects of his determination he assumes a position of vast responsibility. Specifically, on his basic conclusions rest the intrinsic safety of both risk and borrowed capital. Even in the processes involved in bringing oil to the surface, engineering is not without its authority and certainly its know-how. But from the point of immediate contact of the product to human manipulation the role of management begins to assert itself, and its importance is magnified many times throughout the ultimate processes leading to future consumption. Here begins the involvement of a constant relationship and close understanding between two essential groups of equal importance, the technician and those who depend upon the technician. In the field of petroleum property financing this relationship is just as important as in all other operating and research phases of the petroleum industry.

The almost sudden transition in the banking concept as related to oil has produced a strong temptation to try to reduce the engineer's report to some single formula by which the answer could be found on the last page in definite and unequivocal language as to the amount, terms and perfect safety of a proposed loan.

How quickly management would surrender its functions if such were the case. And how ultimately useless would be the conclusions of the engineers if they were not tempered by basic assumptions which management must help determine; or if they were not subject to all the vagaries of human conduct or instability of economic conditions which surely are within the province of both technician and management to appraise. There frequently occurs wide variations of values in appraisal reports on the same oil property. Just as often substantial differences are seen in the findings of reputable engineers as compared with those of the bank's own engineers. These differences are not too great in terms of recoverable barrels either as applied to the total lease or in terms of per acre foot recovery. The differences are not too significant if the sources are reliable. Petroleum engineering is still not such an exact science as to permit complete unanimity in the interpretation of all the various data on the part of two or more engineers. There is fortunately sufficient agreement to arrive at minimum recoveries on which to make perfectly safe calculations as a basis of lending money. The differences to which we devote

the most attention stem from the translation of those recoverable barrels into present-day dollars.

It is in that area that we stress the utmost need for study and understanding and close cooperation between engineer and management. It is here that management must join with engineering in answering these questions:

- Is the operator of the lease capable both financially and from the standpoint of technical know-how of producing the recoverable oil? It could be that a lease in the hands of one operator could have an altogether different ultimate value than in the hands of another.

- How long is it going to take to produce the recoverable oil? It is necessary to consider not only the usual projected decline curve over the life of the lease, but the pure function of the engineer. There must be recognized such factors as proration, which will be influenced by market demand. The market demand will be affected, in turn, by such things as foreign imports, discovery of new fields, or exhaustion of old fields, and a wider use of gas and LPG. It is essential to consider, in short, a complexity of unpredictable economic factors which could have a significant effect on the time element of ultimate recovery.

- How much is it going to cost to produce the recoverable oil—not based on today's cost—but next month's, next year's and the years after that?

- What will be the price of oil over the life of the property?

- What will be the cost of money over the life of the property?

- What will be the effect of any adverse legislation which may be directed against the oil industry? How would engineers alter present worth dollar values if the industry were to be deprived of the 27½ percent depletion allowance or the expensing of intangible drilling costs?

- What would be the impact on values of further tax levies—both income and otherwise?

*We can place pretty full reliance on recovrable barrels, but the vast uncertainty of what will ultimately happen to the value of those barrels in terms of what's left to pay the debt is a problem to be shared by both engineering and management.*

No one in the oil lending business has yet known the effect of a cut in the price of crude. From the advent of the East Texas field, when bank financing of oil really began, the price of oil, as in the case of most everything else, has been on a constant rise. Comparatively, it probably should go higher. But any projection of future income over a period of years must certainly be burdened with the possibility of price recession.

In discussing long range values, particularly in connection with applications for loans which would have to be projected over a good part of the productive life of the property, we are frequently confronted with the apparently plausible argument: "What difference does it make how long it takes to get your money back if you are satisfied the reserves are ample?" The answer assumes for argument the absurdity that the reserves are inexhaustible. If the rate at which they can be produced is limited by certain factors, and if such limitation exposes the collateral to many years of interest, tax, and operating charges and other uncertain economic factors, its potential value pinches out, and the worth of the asset has just as definite a ceiling as a life insurance annuity.

The role of management in all these areas of human and economic consideration is at once apparent. Management both supplements and complements the function of the engineer. That relationship is just as vital in the operations of the borrower as in the origination and management of the loan. The author is convinced that the few instances of default or other difficulties which have arisen in several large size oil loans that have been a matter of public attention have not been so much engineering failures as they have been management failures, on the part of either the lender or the borrower, or both.

Bankers sometimes wish it were possible to lend money safely on oil by some magic yardstick that could place the full responsibility on an engineer's appraisal. In the exercise of their best judgment our engineers are instructed in addition to arriving at the present worth of any given property to assign an arbitrary loan value to the property based on the maximum they feel can safely be loaned in the light of all known and anticipated conditions. This is a function of management which can be shared with a bank's technical staff. Their loan value is not always adhered to. The bank may sometimes lend more, sometimes less, but invariably in consultation and in sharing of the management function. Management, as a policy, arrives from time to time, in cooperation with the bank's engineering staff, at the various discounts used for contingencies, and at the arbitrary maximum payout period of any loan, regardless of reserves. Only through the full assumption of the responsibility on the part of management, in cooperation with its technical staff, can money be safely loaned on oil in the ground.

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**About the Author**

EUGENE McELVANEY is senior vice president of the First National Bank in Dallas, Texas. He has been associated with petroleum development not only as a banker but as a director of several oil and gas companies and as an officer of an oil industry association. He was elected a director of Texas Pacific Coal and Oil Company in 1952. He also is a director of Tennessee Gas Transmission Company and Tennessee Production Company. McElvaney has been active in the Texas Mid-Continent Oil and Gas Association and is now treasurer of that association.

# Why Is Taiwan Drawing Interest?

**Geological surveys strike pay dirt; follow-up seismograph work recommended.**

DESPITE ITS NEGLIGIBLE crude production, the island of Taiwan (Formosa) has held the interest of petroleum geologists and the results of reconnaissance of the island made during the past summer were sufficiently favorable to warrant a report recommending a follow-up seismographic survey be made.

Taiwan has seven productive fields that are results of 251 wells drilled by the Japanese prior to World War II. Crude production from the area in 1951 averaged less than 100 barrels daily, while nearly 3.3 MMCF of gas a day was produced during the year. Accumulated production through 1951 amounted to about 1.3 million barrels of crude and 44 billion cubic feet of gas.

Oil and gas seepages are fairly common in the western foothill provinces. When the Japanese obtained control of the island in 1895, interest in oil was promoted through government-sponsored geological surveys and payment of subsidies to prospectors. The first geological map was completed at the turn of the century, and additional maps and bulletins were issued during the 30's. Lack of technical know-how, however, led to the drilling of an unusually large proportion of dry holes. Japanese geophysical maps oversimplified existing structures and Japan's exploration and drilling methods were rigid and inadequate.

The accompanying map shows major oil and gas fields. Most producing fields are situated in the foothill provinces which run north to south the entire length of the island and are sandwiched between the other two physiographic provinces of the island—the mountain range provinces in the east and the coastal plain area in the west.

The foothills province is composed of tightly folded and faulted sedimentary rocks of Tertiary age, although most of the faulting and folding are believed to have occurred after that period. The following fields listed by reference numbers shown on the map are located in this area: Chutung (1), Chinshui (2), Chuhungkeng (3), and Niushan (4). The fields have horizons varying in depth from 1000 to 10,000 feet. Exploration is being carried out in other areas of the province.

The most complex geological province of the island is the eastern mountain range which is composed of metamorphosed sedimentary rocks, part of which may be as young as Tertiary in age. Rocks in this province are highly disturbed by a complex system of folding and faulting. The Kuohsing (5) producing area is situated in this province. The metamorphism in both mountain and foothill provinces is considered responsible for the fact that more gas than oil has been discovered and that the oil produced is of very high gravity.

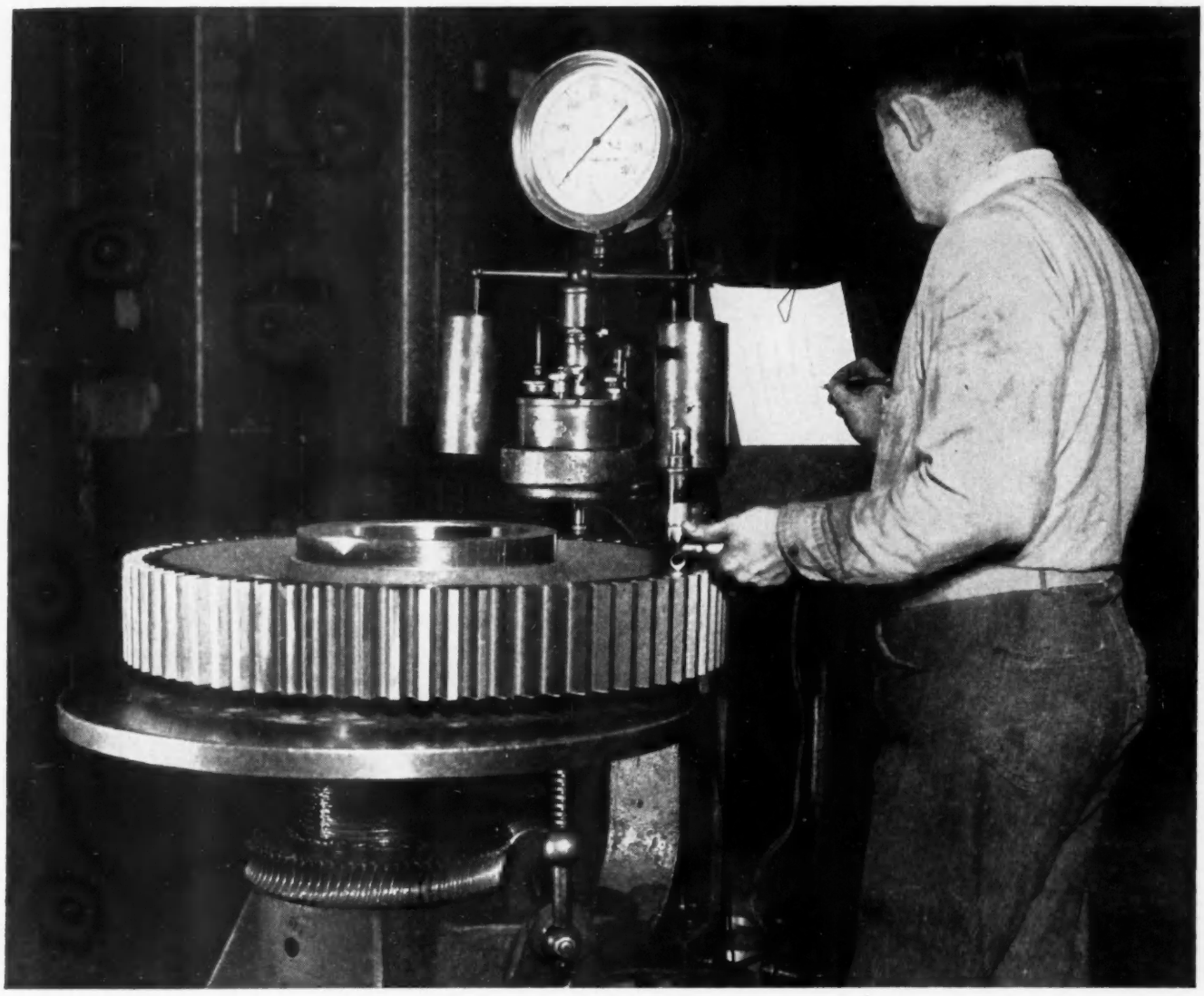
Least explored, though most promising oil-wise, is the coastal plain area which is covered in most places by relatively flat lying recent sediments. In the northern portion of this province, a thick section of terrace or bench-forming gravel is also present. Some slight tilting of the recent formations can be observed.

According to reconnaissance made last summer, it is believed that Miocene and Pliocene sediments underlie the western plain since the entire area appears to be the eastern end of a large sedimentary basin. Extent of the basin is not known, but the presence of basaltic masses, represented by the Pescadores Islands, would indicate that it is of considerable extent. In fact, the area under which these Miocene sediments are covered and where folding can be expected appears much larger than the Los Angeles Basin in California, and may well offer a comparable structural pattern.

While only Miocene formations are known to be oil bearing, it is not improbable that also the Pliocene may offer good prospects for oil discoveries. A seismographic follow-up survey was recommended since only seismograph studies can determine and outline the nature of the folds that undoubtedly underlie the western plains area of Taiwan. It appears likely that some of the structures found there will be oil bearing.

Any significant increase in the domestic production of crude would be of great economic significance to Taiwan. The area consumes at present about 6000 barrels daily, principally in the densely populated eastern part of the island. Taiwan's most important industries are centered around its capital, Taipei, located in the north of the island, and around Kashsiung, in the southwest.

A Japanese-built 18,000-barrel-a-day refinery at Kaohsiung supplies all the bulk product requirements of the island with most of the specialty products imported from the U. S. The Kaohsiung refinery runs on Middle East crudes resulting in an annual drain on Taiwan's foreign currency availability of about $8 million, largely hard currencies. A government enterprise, the Chinese Petroleum Company, owns and operates both oil fields and the refinery. Exploration and exploitation is not opened to private industry at present.



*Checking a locomotive spur gear at one of the great General Electric plants.*

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## BETHLEHEM FORGED-and-ROLLED CIRCULAR BLANKS

Ed Donaldson . . . a robust laugh, an encyclopedic memory.

# The Man Who Wasn't Blown Up

**Meet one of the survivors of that iron-nerved horde who came out of Pennsylvania and Ohio in the last century to pour liquid nitroglycerin down the throats of angry wells.**

**By AL REESE,** WORLD OIL Staff

THIS NATION remembers Oct. 29, 1929, as the day it lost its shirt.

W. E. Donaldson remembers it as the day he lost his pants.

The shirt was plucked off by the stock market.

The pants were blown off by 3050 quarts of nitroglycerin.

Donaldson is a survivor of that legion of doughty shooters who swarmed out of Pennsylvania and Ohio in the last century, ramming nitro down the throats of angry wells that were already spitting over the derrick.

At 81, he believes himself the second oldest living shooter. Johnny Larkin of Tulsa, who is on the wiser side of 90, holds the top honor in a list of 596 names compiled recently by the long efforts of active and retired shooters, families and friends of deceased shooters, and business associates.

Of the 596 listed, only 323 remain, both active and retired. Of the 273 who have gone, 157 died of natural causes and 116 died violently—most of them blown up.

Donaldson, a shaved and slimmed-down counterpart of Santa Claus, with something of the jolly saint's robust laughter and all of his encyclopedic memory, can remember 286 of those listed. And as he rocks in retirement on the wide front porch of his elm-shaded home in quiet Winfield, Kansas, he remembers few more vividly than A. J. Berry, the man who introduced him to the profession he was to follow for only one year less than half a century.

Ed, the son of a blacksmith, was born Sept. 9, 1872, in Macksburg, Ohio, and at 21 went to work in a nearby field of the same name. A little later, as a Macksburg sand well was being competed from 500 feet, Berry, the shooter, turned up with lumbago. That meant he couldn't shoot, for speed afoot, though incidental to the actual shooting technique, was vital to the health of the shooter. When the go-devil slid down the hole toward that liquid nitro at the bottom, it was time to go.

"Berry," said Doc Stevens, the operator, "since you can't shoot, show Ed how."

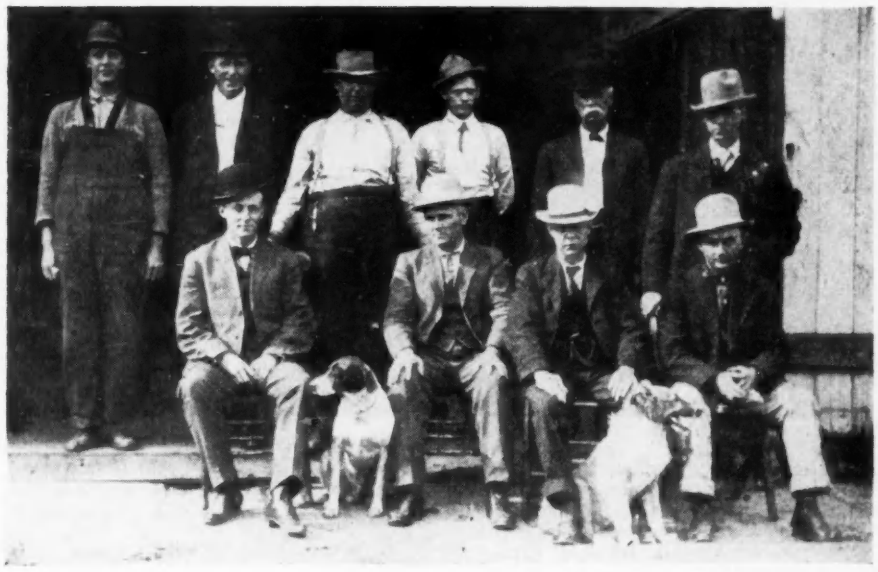
Berry did, and Donaldson recalls that his first venture was a great success. "Just one little thing spoiled it," he remembers. "The doggone well burned up."

This incident happened just after the era of the "Moonlighters," a group who dared death in the darkness, and the law besides, to shoot wells.

**Moonlight Mischief.** Donaldson says the Moonlighters came into being because of a patent granted to a Colonel Roberts to set off explosives "under fluid" in order to increase the production of oil wells. Since all wells

**DONALDSON DID IT.** This is C. B. Shaffer's Sololo Jones 1, first well ever shot in the Drumright field, as it looked in July, 1912, after Donaldson had cracked the Oswego lime with 180 quarts of nitroglycerin.

**READY TO SHOOT** was Prairie Oil & Gas Company's Cogee West 12 when this picture was taken. The well was making about 30 barrels per hour natural. Note the shooter's wagon.



**FOUR OF THESE** ten shooters were blown up. The picture, taken at Lawrenceville, Ill., in 1910 shows, standing, left to right: Fred Mack, Charles Townsen, Al Stoops, George Catterlin, A. J. Bankston (who later founded Rock Glycerin Company), and Nelson (Doc) Mosier. Sitting, left to right, are Joe Lippert, Al Hays, W. E. Donaldson, and Billy (Chic) Snyder. At the moment of his death Hays had put his shot in the hole and was at the wagon preparing a jack squib. This accident, which happened in 1916 at Drumright, also took the life of Barney Black, superintendent at the well. Mosier was blown up while carrying two 10-quart cans of nitroglycerin from his shooting car to a well in the Hull-Silk field near Wichita Falls in 1948. Townsen had nitroglycerin in his car when he hit a culvert near Lawrenceville about 1920. Mack was blown up near Robinson, Ill., while pulling a line squib, a small squib used in holes previously shot. The squib did not detonate and Mack had pulled it up to the casinghead for an examination when it went off.

**THE LARGER SHELLS** were used by shooters in the Bartlesville sand at Drumright. Shooters began using autos in 1914.

**TRAVEL CONDITIONS** like this shortened the life of many a shooter.

**TWO VIEWS** of the infant Drumright. The street divided the old Drumright and Fulkerson farms. Some old-timers still know the western part of Drumright as "Tiger." According to Ed Donaldson, the name originated from a star route postoffice and store originally located two miles north and two miles east of the town. When the Drumright boom began, the storekeeper-postmaster moved his establishment so he could sell more merchandise. Donaldson says the U. S. Postoffice department was several months discovering that "Tiger, Okla.," had picked up and moved four miles.

were drilled in wet, the only legalized shooter was Colonel Roberts, who had been in Pennsylvania almost as early as Colonel Drake. Further assuring his monopoly, Roberts had possession of most of the limited supply of glycerin in that area.

Lacking explosive, and forbidden by law to use it for shooting, operators had to knuckle under to Roberts' expensive demands for his services.

Then came the Moonlighters. "They beat the old Colonel two ways," says Donaldson. "At first they'd steal his glycerin and slip out after dark to shoot wells. Later on, they got smarter. Colonel Roberts' fees were based on the number of quarts he shot, so an operator would tell him to come out the next day and shoot a small charge.

"That night the Moonlighters would obtain nitroglycerin and load the well. Next day they'd sit back where it was safe and watch the Colonel ease his little charge down on top of their big one and then set them both off."

The shooting technique employed by Roberts entailed, first, a tin container, or shell, of a diameter three-fourths inch smaller than the hole. After liquid nitroglycerin was poured in, the shell was capped by an iron firing-head. A pin was fixed through a hole in the center of the firing-head, its point just above a gun-cap. Then the shell was gently lowered to bottom.

To set off the charge, the shooter would drop a go-devil. This consisted of an eight- or ten-pound chunk of cast iron, its perimeter molded back into flanges to hold it upright on its course to the bottom, and with a solid core that was supposed to strike the pin, which fired the gun-gap, which set off the nitroglycerin.

Donaldson recalls that the firing-head gave way to the jack squib about 1907. The jack was a container into which was placed a stick of dynamite with a fuse leading through the top. The fuse was of a length to burn two minutes—enough to permit the shooter to scamper a safe distance. Then the jack was dropped into the well.

These jacks were used until the advent of the time bomb in 1924.

Another innovation of 1907 was to spare more lives than any other advance made by the shooting profession. This was solidified nitroglycerin. While not nearly as safe as today's nitroglycerin, the first solidified variety was much more predictable than the liquid.

**Brush With Death.** It was while the liquid explosive was being used that Donaldson had his first reprieve from death. He had drifted to Indiana in 1896, and two years later at Bluffton he joined E. I. du Pont de Nemours & Company, a firm he was to serve intermittently until his retirement in 1942. He was a nitroglycerin maker's helper, which meant he spent part of his time making nitroglycerin and the remainder shooting wells. In 1901 Du Pont placed him in charge of the shooting station at Montpelier, Ind., near the Godfrey Reserve field.

It was to make a trip to Godfrey Reserve one day that he called at the livery stable for his team and shooting wagon. One of the swipes asked to go along. Donaldson nodded permission—an act which was to prolong his life.

The well was on the far side of a creek spanned by a bridge fashioned of 7½-foot lengths of tank lumber. The horses approached down a muddy incline, slipped off the side of the narrow structure, and plunged into the water. The explosives-laden wagon teetered half on, half off the bridge.

Donaldson lunged to curb the frantic horses. The swipe dug into Ed's pocket for a knife and cut the harness. Then both men steadied the wagon and yelled for help.

The rig's crew ran up with a rope sand line long enough to reach the engines 200 feet distant. They tied on to the bridge and slowly pulled it away, allowing the wagon to be eased upright into the water.

Perhaps because of the long, agonizing minutes involved, this incident is more painfully etched in Donaldson's memory than many another in which destruction was shiveringly close. Notable among these were the repeated occasions when he wrestled the temperamental nitroglycerin into solid, screaming columns of oil coming up from the great Drumright, Okla., formations.

Donaldson had left Montpelier and Du Pont in 1904 for Homeworth, Ohio. By 1907 he was back with du Pont at Flat Rock, Ill., and then Lawrenceville, Ill. In 1912 he took a flyer to help with the organization of

Central Torpedo Company at Tulsa. This firm folded in 1926, after which Donaldson returned to du Pont for the last time. The intervening 14 years contained some of the most hazardous moments of his life and, looking back, one of the proudest.

**First at Drumright.** Donaldson was the first to shoot a well in the Drumright field. It was the Sololo Jones 1, 2200 feet west of C. B. Shaffer's Wheeler 1, the field's discovery.

These wells, producing from the Oswego lime, were usually comparatively small and involved no unusual shooting problems. Then the Bartlesville sand was tapped and the Jackson Barnett 1 tanked 19,000 barrels in 24 hours. Many and many another came in over the crown block. But none was big enough to satisfy the operators. World War I was blazing and crude was marching up toward $3 a barrel. Shooting every well continued as a routine completion practice. Routine, that is, for the operators. For the shooters it meant a daily flirtation with death, and some there were who received an everlasting embrace.

To overcome the tremendous pressures, the shooters had to abandon 28-inch jack squibs of 1¾-inch diameter in favor of seven-foot jacks of two inches in diameter. The size of the charges was increased somewhat from 40 to 80 quarts, but most of the space differential was occupied by 30 to 60 pounds of shot, and sometimes even more when pressures were extremely high. Jack squibs were also heavily weighted.

Donaldson's Drumright experiences left him with an almost unshakeable fatalism. Almost, but not quite. It was shaken rather thoroughly on that Black Friday he lost his pants.

By 1929 Ed had moved to Winfield and settled in the comfortable home in which he now resides. His glycerin was stored just out of town in two magazines a few feet apart. Each magazine had an area of 8 by 12 feet and was jammed with slightly more than 1500 quarts each. Because nitroglycerin freezes at 45° F. and becomes more temperamental with each freeze and thaw, the magazines were lined with felt wall board and heated by small kerosine stoves with 16-inch tin stacks, intended to spread the gentle warmth.

On this day Donaldson parked his car close in front of one magazine and swung open the door. The draft fanned the stove. The blaze licked the wall board and spread. Ed took a few frantic swipes with his hat, realized it was futile, and sprang for Oklahoma. He remembered to run around the automobile and also to head downwind in accordance with the shooters' teachings that a blast coming downwind is less likely to shatter the eardrums.

He was 275 feet nearer Tulsa when that part of Kansas erupted.

After fetching another pair of pants, he measured the distance from his last footprint to the spot he landed after the blast. It was 30 feet.

—**The End**

# The Big Moment . . .

## for M. L. (Mike) BENEDUM

A MILL ACCIDENT, an act of courtesy, and faith in the judgment of a near-stranger pyramided into The Big Moment for Michael Late Benedum, pioneer wildcatter.

Mike's father, Emanuel, had wanted the boy to attend West Point and become another Stonewall Jackson. But the depression that followed the Civil War forced 16-year-old Mike to take a job in a flour mill at Bridgeport, W. Va., at a wage of $16 a month. At 20 he was the $50-a-month manager of a mill at Lumberport. A terrific influx of wheat forced Mike and his helpers to work round the clock. One night, groggy from lack of sleep, Mike was cleaning out a pipe through which the flour was fed. The sleeve of his denim coat was caught in the machinery and his arm was mangled.

During the months of ensuing idleness, young Benedum decided that the milling field had no future. So on a hot summer morning in 1890 he boarded a train to seek his fortune in Parkersburg. There were only two coaches—a "ladies' car" and smoker—and both were crowded. He found a seat, but not so the big man with flowing moustaches who got on the train at Wilsonburg. Mike offered the newcomer his seat, and the older man accepted after the youngster agreed to sit on the arm.

The big man was John Worthington, general superintendent of South Penn Oil Company, and when he left the train at West Union after a ride of 45 minutes, he was accompanied by his new lease agent, Mike Benedum.

Late in 1894 Mike was the $150-a-month assistant general land agent for South Penn. On a summer day in the following year as Mike was lunching in the Parriott Hotel in Cameron, he was approached by Joseph Clifton Trees, a red-headed giant whom he knew only slightly. Trees had paid a farmer $45 for an option on half of an eighth royalty in Pleasants County. "The farm is right on the trend," he told Mike. "The land's leased and I'm sure they'll be drilling soon."

Mike wrote out a check for $1195, agreeing to take three-fourths of the half royalty.

That was The Big Moment for Mike Benedum. The investment paid itself out several times over in three or four years and convinced him that he would go further by being his own boss.

# The Farmers' Problems Are Oil Industry Problems, Too

**People of the petroleum industry should be genuinely interested in the present farm problems of surpluses and overproduction and in efforts to stabilize agriculture. Farmers provide large markets for petroleum, and their buying power greatly affects the whole national economy. Furthermore, overproduction is a problem that also has plagued the petroleum industry, especially in pre-proration days.**

The U. S. government now holds about $2.5 billion worth of surplus farm commodities, nearly the same as the record quantities held just before the Korean war. New surpluses from latest crops may put into government warehouses $2.5 billion more of cotton, corn, and wheat plus additional oats, barley, etc.

Acreage controls on some 1954 crops may help to cope with future surpluses. But allowed acreage may be made more productive by use of fertilizers and more attention. Production of several major farm commodities has been increased to levels 20 to 50 percent above prewar, and exports have been declining, as European reconstruction has advanced. Increased farm producing capacity reflects mechanization of farming and sharply increased use of petroleum for powering tractors, trucks, harvesting machines, pumps, and other farm equipment.

In some lines, fluctuating prices fairly well balance supply with demand. But in some industries, including petroleum as well as agriculture, balancing of supply with demand may involve special problems and be especially difficult. In the past, prices of petroleum and of farm commodities often had to drop to ruinous levels and stay there for some time to get rid of surpluses and stop overproduction. Such surpluses were conducive to depressions and "hard times."

In the petroleum industry this happened a little over 20 years ago, when some crude was sold in the East Texas field for less than 10 cents a barrel. Since then, production has been limited to market demand, to prevent waste, and allowable output has been prorated among producers, under state conservation laws. The petroleum industry has been stabilized and made more efficient, to the public advantage, by the government regulation involved in proration of production.

In the farming industry, also, government measures, such as acreage controls in connection with price supports, have helped to balance supply with demand. The stability of agriculture has been thereby promoted, and from the standpoint that a healthy agricultural industry is vital to the national welfare, the national interest has been served.

# Will Demand Outstrip Imports by 1960?

**Within seven years the U. S. will be unable to meet its needs for petroleum imports because of strong foreign demand for oil in world markets, according to one man's predictions. Consequently, the U. S. will eventually limit residual fuel oil use to that of bunkering ships and will draw heavily on coal supplies for fuel and power, obtaining some liquid fuels as well as much more electric power from coal. While he foresees an "almost explosive expansion" in U. S. consumption of coal, he thinks that only a "minor part" of liquid fuel needs will come from shale.**

These forecasts were made by Eugene Ayres, Gulf Research & Development Company, in a letter that was reproduced in Washington in late October by the National Coal Association. He saw signs that U. S. coal consumption would rise to 600 million tons in 1958, 640 million in 1960, 900 million in 1965, and 1200 million in 1970.

Reasons for coal expansion were cited by Ayres as follows:

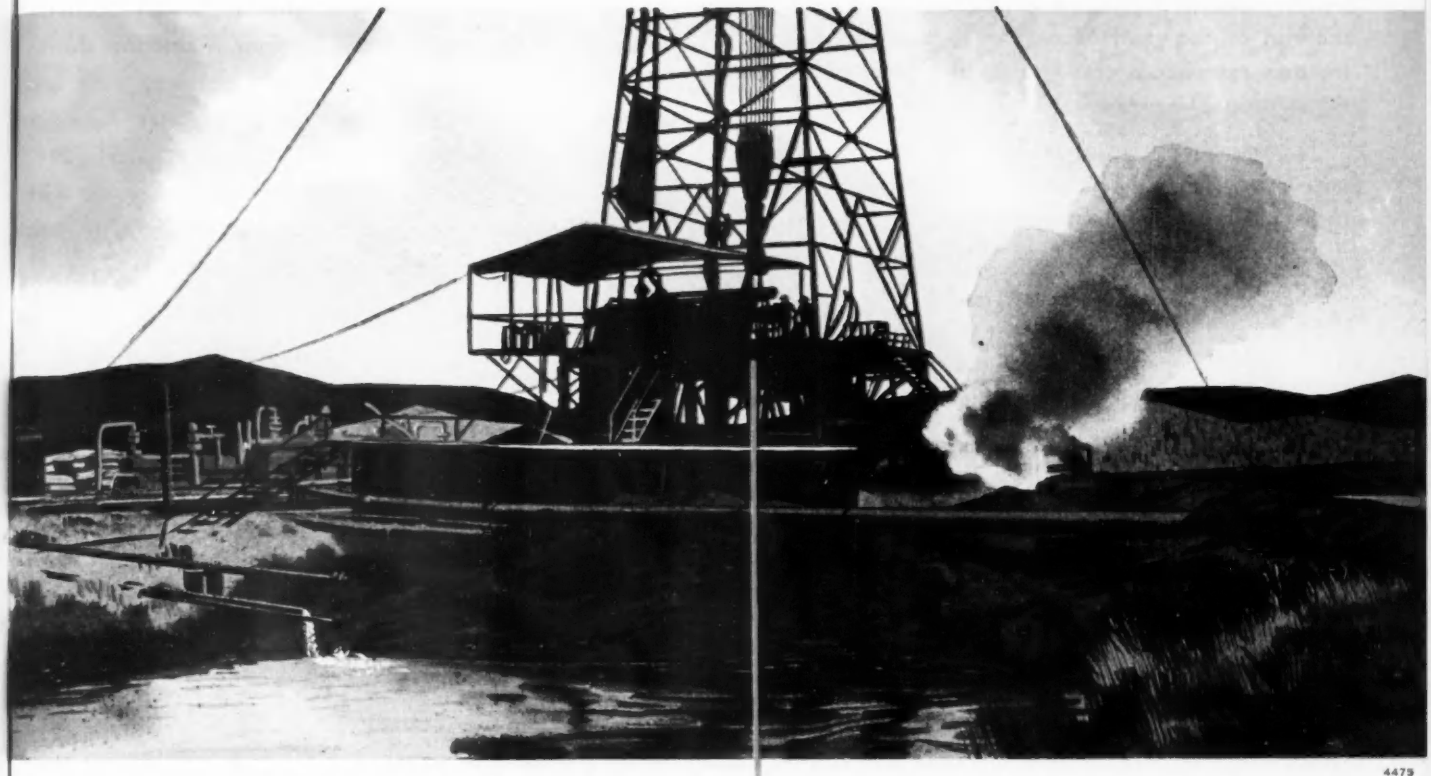
- Increasing demands for electric power.
- Inadequate potential hydropower capacity.
- Expected peaks of U. S. production of natural petroleum and natural gas around 1965.
- Expected peak of world production of petroleum between 1985 and 2000.
- Anticipated high rates of demand for liquid fuels.

By 1960 the U. S. will be unable to import all the oil needed because of the competitive needs of the rest of the world, Ayres predicted. By 1970 the U. S. will want to import 4.5 billion barrels, while the world shortage will be nearly 4 billion. And by 1980, he went on, the U. S.—and the world—will have around seven billion barrels per year less than needed.

Because of these conditions of shortage, said Ayres, the price of petroleum will be high enough to justify the conversion of coal to liquid fuel. No residual fuel oil will then be sold except that required for ship bunkers. However, he thought that only a minor part of liquid fuel needs would come from shale.

Ayres said his estimates assumed that demand for liquid fuels would not be slowed down by higher prices and that the problems involved in increasing the mining of coal could be solved quickly enough to keep pace with demands.

# SCIENTIFIC KNOWLEDGE



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By **RAY L. DUDLEY,** Publisher, and **WARREN L. BAKER,** Editor

# Economic Position Can Be Improved

**THERE IS A GOOD CHANCE** that the industry's economic position may show substantial improvement before the end of the year. Much can be accomplished if the industry exercises restraint and self control of its operations during December.

The most important question is refinery runs. The serious oversupply that has plagued the industry for several months despite record consuming rates, can be improved if refinery operations are held to the relatively low levels of recent weeks.

High production, imports and refinery runs that have prevailed most of the year are responsible for the excessive stocks. Reduced crude production already is assured by another cut in Texas' allowable output for December. This action should result in withdrawals from crude stocks next month, which added to anticipated November reductions would help reduce these inventories to less excessive levels. Now, if refinery runs are kept at a low level, another desirable step will have been achieved.

●

**EXCESSIVE MOTOR FUEL STOCKS** are the most troublesome market factor today. Holding of refinery operations to around 6.9 million barrels daily or less would prevent the manufacturing of too much gasoline, hence extremely desirable. Further progress along this line could be achieved if the industry adjusts yields to make increased quantities of distillate fuel oil and less motor fuel. Such a course of action would bring gasoline inventories nearer to desirable volumes.

It is to be hoped the industry takes advantage of the opportunity the situation offers, and will hold down refinery runs so excessive stocks can be partially alleviated. Otherwise, market troubles will become more severe before the start of the motoring season next spring.

Refinery runs since mid-September have been kept below 7 million barrels daily, but this cutback came much later than desirable. Holding of refinery runs to less than 6.9 million barrels daily is the most important step the industry can take to improve its economic position.

Motor fuel inventories have shown relatively little change since the end of June, although they normally would have been reduced by substantial amounts during this heavy consuming season. High refinery runs and gasoline output offset peak consuming rates. Gasoline stocks in mid-November totaled 145 million barrels, 21⅔ million barrels more than a year ago, and compared with 146 million barrels at the end of June. They will grow considerably by the end of March.

Distillate fuel stocks also are considerably higher than a year ago. Inventories of 134 million barrels of distillate existed on November 14, which was 14¾ million barrels greater than a year ago. The first seasonal reductions in distillate stocks took place during the first week in November. A lengthy cold spell would go far toward relieving these stocks of any excessive amounts. On the other hand, if the winter proves extremely mild the industry will have too much distillate fuel on hand by next spring.

●

**LOWER CRUDE OIL PRODUCTION** in several states during recent months has aided in restoring a better balance between crude supply and demand.

Stocks of crude hit a high for the year of 287¾ million barrels in early October, but had fallen to 283¾ million barrels by November 7. Further reductions are desirable, hence it is encouraging that Texas has established a reduced flow for December. Other states should assist by holding their December production at or below November quantities.

Importing companies also should do their part by holding crude imports to reasonable levels. Imports of crude averaged 659,000 barrels daily in October, compared with 675,000 barrels per day in the two previous months. Holding of crude imports to below 650,000 barrels per day in November and December would help improve the crude oil situation.

*for that big one off shore*

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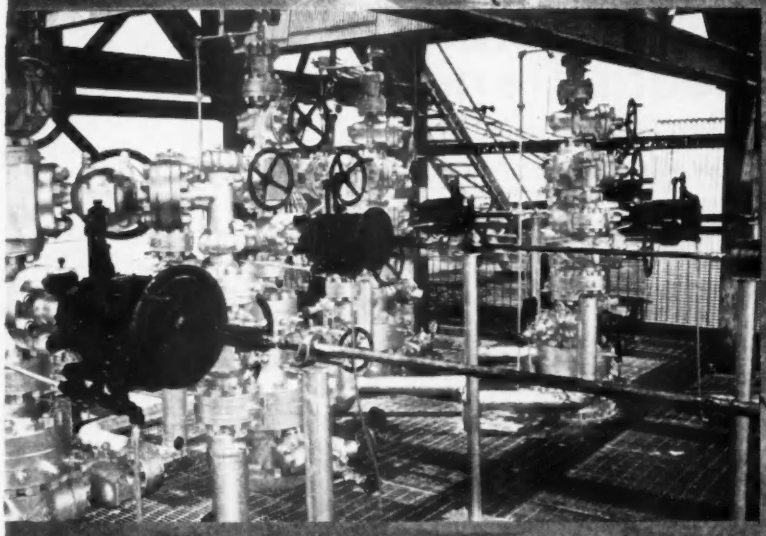

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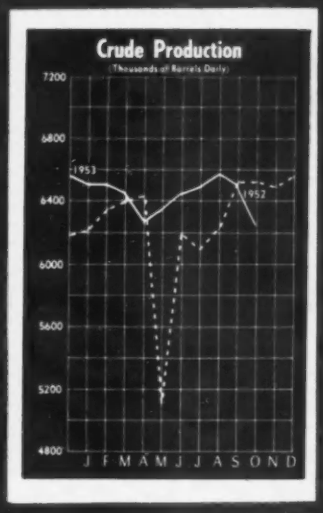
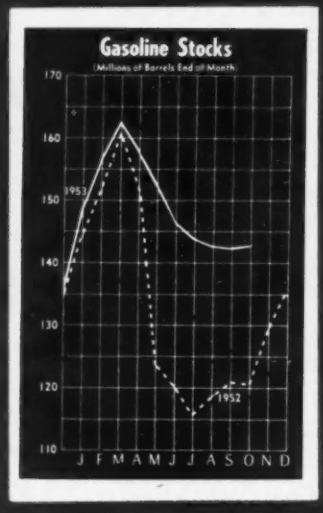
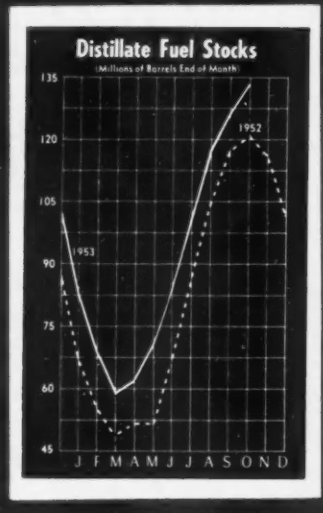
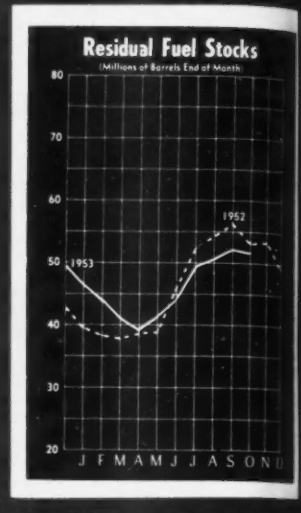
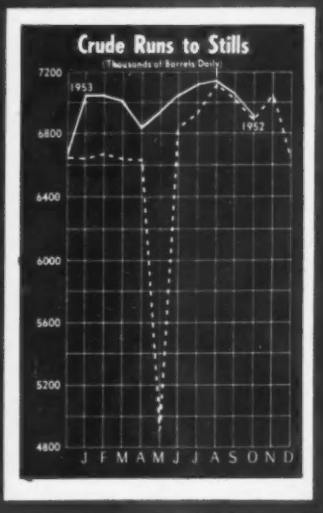
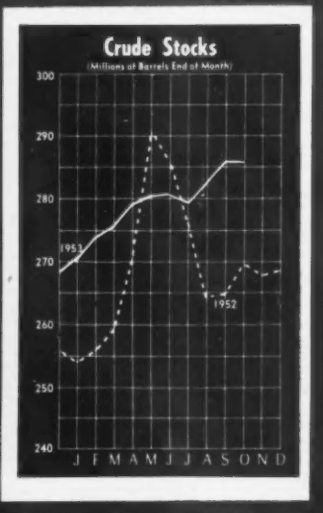


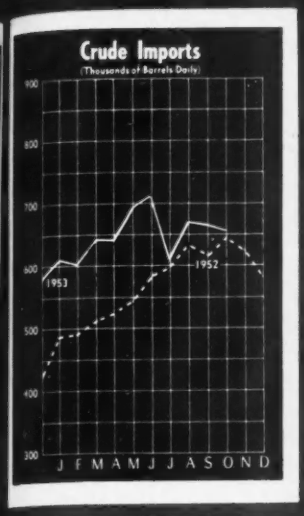

# Petroleum Trends in the U. S. . . .

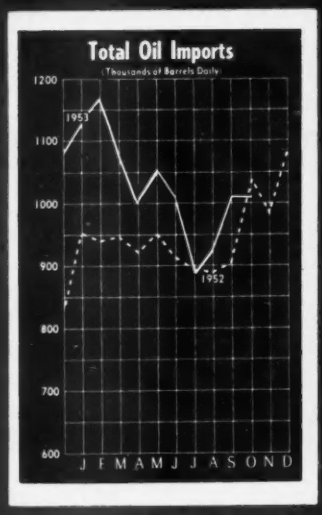
## . . . Wells and Footage Continue Ahead of 1952

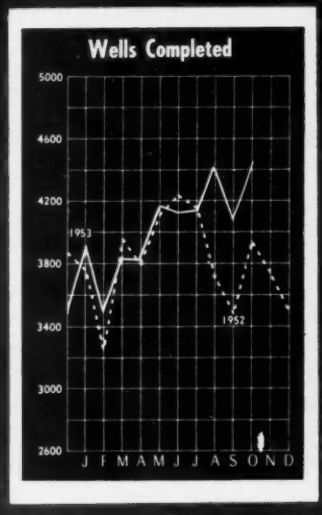
### *U. S. Crude Production by States*

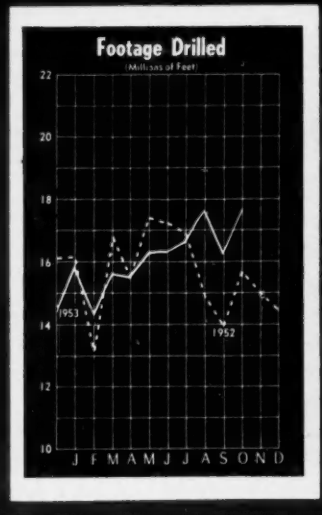
(Thousands of Barrels)

| STATE or DISTRICT | DAILY AVERAGE PRODUCTION | | | | TOTAL PRODUCTION First Ten Months | | |
|---|---|---|---|---|---|---|---|
| | October, 1953 | September, 1953 | October, 1952 | % Diff. October, '52-'53 | 1953 | 1952 | % Diff. '52-'53 |
| Alabama | 4.8 | 5.2 | 3.1 | + 54.8 | 1,459 | 770 | + 89.5 |
| Arkansas | 76.5 | 78.2 | 80.9 | — 5.4 | 24,514 | 24,552 | — 0.2 |
| California | 994.0 | 1,000.6 | 983.4 | + 1.1 | 303,558 | 299,109 | + 1.5 |
| Colorado | 105.7 | 112.6 | 81.2 | + 30.2 | 27,659 | 24,031 | + 15.1 |
| Florida | 1.5 | 1.6 | 1.5 | ..... | 456 | 499 | — 8.6 |
| Illinois | 167.6 | 167.3 | 166.8 | + 0.5 | 49,043 | 48,699 | + 0.7 |
| Indiana | 34.2 | 34.5 | 34.2 | ..... | 10,946 | 10,001 | + 9.4 |
| Kansas | 233.6 | 321.9 | 342.6 | — 31.8 | 97,369 | 94,786 | + 2.7 |
| Kentucky | 32.4 | 31.5 | 30.8 | + 5.2 | 9,547 | 10,176 | — 6.2 |
| Louisiana | 638.9 | 701.8 | 683.2 | — 6.5 | 212,447 | 199,498 | + 6.5 |
| North Louisiana | 104.8 | 109.7 | 116.1 | — 9.7 | 34,484 | 35,431 | — 2.7 |
| South Louisiana | 534.1 | 592.1 | 567.1 | — 5.8 | 177,963 | 164,067 | + 8.5 |
| Michigan | 32.5 | 32.4 | 35.5 | — 8.5 | 10,172 | 11,114 | — 8.5 |
| Mississippi | 91.8 | 96.2 | 98.2 | — 6.5 | 29,607 | 30,175 | — 1.9 |
| Missouri | 0.1 | 0.1 | 0.1 | ..... | 18 | 19 | — 5.3 |
| Montana | 33.5 | 33.0 | 29.1 | + 15.1 | 9,620 | 7,747 | + 24.2 |
| Nebraska | 13.1 | 15.7 | 8.4 | + 56.0 | 4,869 | 1,879 | +159.1 |
| New Mexico | 202.0 | 199.2 | 172.7 | + 17.0 | 58,320 | 48,419 | + 20.4 |
| New York | 12.2 | 12.5 | 11.7 | + 4.3 | 3,334 | 3,590 | — 7.1 |
| North Dakota | 13.4 | 12.8 | 6.1 | +119.7 | 4,314 | 898 | +380.4 |
| Ohio | 10.7 | 10.5 | 9.2 | + 16.3 | 2,937 | 2,673 | + 9.9 |
| Oklahoma | 519.0 | 551.7 | 535.4 | — 3.1 | 169,637 | 159,535 | + 6.3 |
| Pennsylvania | 26.8 | 28.1 | 30.0 | — 10.7 | 8,835 | 9,383 | — 5.9 |
| Tennessee | 0.1 | ..... | 0.1 | ..... | 10 | 8 | + 25.0 |
| Texas | 2,740.9 | 2,788.6 | 2,970.0 | — 7.7 | 863,225 | 844,486 | + 2.2 |
| Dist. 1—South Central | 39.1 | 40.0 | 37.2 | + 5.1 | 12,112 | 10,214 | + 18.6 |
| Dist. 2—Middle Gulf | 151.2 | 154.7 | 173.6 | — 12.9 | 46,862 | 48,338 | — 3.1 |
| Dist. 3—Upper Gulf | 459.5 | 468.7 | 509.2 | — 9.8 | 142,445 | 143,703 | — 0.9 |
| Dist. 4—Lower Gulf-S.W. | 260.0 | 264.0 | 277.1 | — 6.2 | 80,594 | 78,349 | + 2.9 |
| Dist. 5—East Central | 47.9 | 48.7 | 51.7 | — 7.4 | 14,864 | 16,570 | — 10.3 |
| Dist. 6—Northeast | 372.4 | 382.4 | 381.5 | — 2.4 | 115,433 | 118,673 | — 2.7 |
| Dist. 7-B—North Central | 117.9 | 117.0 | 110.6 | + 6.6 | 36,559 | 28,080 | + 30.2 |
| Dist. 7-C—West Central | 167.4 | 166.0 | 178.0 | — 6.0 | 51,885 | 44,150 | + 17.5 |
| Dist. 8—West | 864.3 | 883.3 | 1,014.2 | — 14.8 | 267,924 | 284,901 | — 6.0 |
| Dist. 9—North | 185.8 | 188.7 | 186.5 | — 0.4 | 57,612 | 50,307 | + 14.5 |
| Dist. 10—Panhandle | 75.4 | 75.1 | 82.4 | — 8.5 | 23,382 | 25,004 | — 6.5 |
| Utah | 4.8 | 4.7 | 5.2 | — 7.7 | 1,529 | 1,421 | + 7.6 |
| Virginia | 0.1 | 0.1 | 0.1 | ..... | 13 | 9 | + 44.4 |
| West Virginia | 9.5 | 9.3 | 7.5 | + 26.7 | 2,464 | 2,159 | + 14.1 |
| Wyoming | 240.4 | 245.0 | 190.5 | + 26.2 | 69,866 | 56,105 | + 24.5 |
| Total United States | 6,240.1 | 6,495.1 | 6,517.5 | — 4.3 | 1,975,768 | 1,891,741 | + 4.4 |




By CECIL W. SMITH, WORLD OIL Staff

## U. S. Refiners Cut Back Operations Again . . .

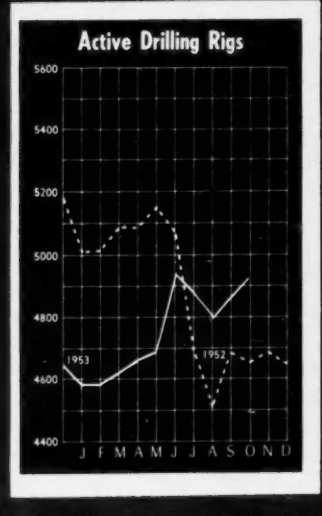
## . . . Crude Production at a 14-month Low.

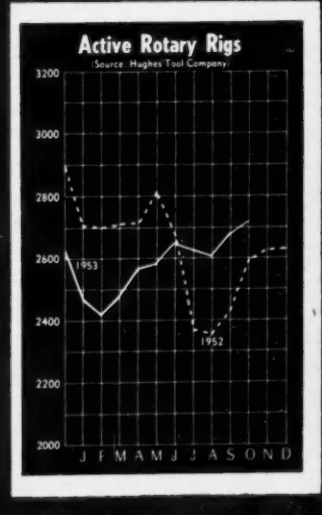
### *Crude Oil and Refined Products Trends*

(Thousands of Barrels)

| MONTH | CRUDE OIL | | | GASOLINE | | DISTILLATE FUEL | | RESIDUAL FUEL | | DAILY IMPORTS | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Production Daily | Runs to Stills Daily | Stocks End of Month | Production Daily | Stocks End of Month | Production Daily | Stocks End of Month | Production Daily | Stocks End of Month | Crude Oil | Total Oils |
| 1951: | | | | | | | | | | | |
| September | 6,261 | 6,558 | 254,900 | 3,127 | 124,530 | 1,282 | 104,082 | 1,228 | 49,608 | 500 | 744 |
| October | 6,375 | 6,446 | 262,266 | 3,105 | 118,864 | 1,295 | 109,544 | 1,224 | 49,573 | 421 | 769 |
| November | 6,272 | 6,609 | 261,100 | 3,130 | 122,723 | 1,358 | 101,666 | 1,304 | 46,491 | 425 | 802 |
| December | 6,182 | 6,646 | 255,783 | 3,150 | 134,867 | 1,442 | 86,619 | 1,313 | 42,853 | 423 | 834 |
| 1952: | | | | | | | | | | | |
| January | 6,217 | 6,640 | 254,007 | 3,094 | 144,339 | 1,456 | 66,969 | 1,338 | 39,523 | 488 | 951 |
| February | 6,367 | 6,673 | 255,900 | 3,109 | 151,912 | 1,528 | 55,369 | 1,322 | 38,295 | 491 | 940 |
| March | 6,388 | 6,640 | 259,126 | 3,069 | 160,689 | 1,400 | 48,750 | 1,274 | 37,971 | 510 | 947 |
| April | 6,429 | 6,435 | 270,679 | 2,995 | 151,890 | 1,312 | 51,634 | 1,253 | 38,561 | 539 | 922 |
| May | 5,107 | 4,905 | 290,813 | 2,295 | 123,656 | 982 | 51,648 | 979 | 38,821 | 545 | 951 |
| June | 6,197 | 6,825 | 285,964 | 3,169 | 120,166 | 1,455 | 65,911 | 1,228 | 45,688 | 581 | 911 |
| July | 6,093 | 6,927 | 275,951 | 3,295 | 116,566 | 1,475 | 85,775 | 1,237 | 52,245 | 597 | 892 |
| August | 6,219 | 7,118 | 264,368 | 3,377 | 118,592 | 1,514 | 104,257 | 1,252 | 54,061 | 632 | 879 |
| September | 6,518 | 7,017 | 264,723 | 3,428 | 120,991 | 1,502 | 117,252 | 1,230 | 56,200 | 615 | 932 |
| October | 6,518 | 6,883 | 269,776 | 3,301 | 120,062 | 1,458 | 120,721 | 1,203 | 53,052 | 643 | 1,037 |
| November | 6,487 | 7,049 | 267,852 | 3,416 | 129,509 | 1,510 | 116,096 | 1,299 | 53,069 | 624 | 984 |
| December | 6,634 | 6,952 | 271,928 | 3,361 | 136,028 | 1,509 | 99,582 | 1,302 | 48,706 | 603 | 1,165 |
| 1953: | | | | | | | | | | | |
| January | 6,555 | 7,042 | 272,250 | 3,384 | 150,518 | 1,528 | 80,655 | 1,307 | 45,910 | 616 | 1,135 |
| February | 6,562 | 6,969 | 273,589 | 3,379 | 157,873 | 1,505 | 67,167 | 1,275 | 44,178 | 586 | 1,066 |
| March | 6,531 | 7,002 | 275,665 | 3,319 | 162,731 | 1,489 | 59,802 | 1,256 | 41,600 | 655 | 1,112 |
| April | 6,446 | 6,781 | 280,487 | 3,282 | 158,032 | 1,424 | 61,349 | 1,219 | 39,572 | 628 | 1,010 |
| May | 6,390 | 7,002 | 280,308 | 3,459 | 156,415 | 1,400 | 73,706 | 1,197 | 41,795 | 703 | 1,096 |
| June | 6,595 | 7,081 | 283,715 | 3,467 | 146,196 | 1,462 | 84,504 | 1,238 | 43,801 | 707 | 1,050 |
| July | 6,603 | 7,103 | 284,976 | 3,583 | 143,916 | 1,441 | 102,394 | 1,224 | 47,966 | 629 | 946 |
| August | 6,583 | 7,163 | 285,352 | 3,592 | 146,050 | 1,437 | 119,542 | 1,222 | 50,007 | 672 | 946 |
| September | 6,495 | 7,044 | 286,431 | 3,497 | 142,906 | 1,430 | 126,694 | 1,222 | 51,922 | 672 | 1,015 |
| October | 6,240 | 6,878 | 286,401 | 3,417 | 143,368 | 1,452 | 134,631 | 1,175 | 51,558 | 659 | 1,010 |
| Oct., 1953 Change: | | | | | | | | | | | |
| In Month | −255 | −166 | −30 | −80 | +462 | +22 | +7,937 | −47 | −364 | −13 | −5 |
| In Year | −278 | −5 | +16,625 | +116 | +23,306 | −6 | +13,910 | −28 | −1,494 | +16 | −27 |
| Week Ended: | | | | | | | | | | | |
| 11-14-53 | 6,219 | 6,951 | 284,932 | 3,506 | 144,954 | 1,435 | 133,983 | 1,143 | 51,696 | 775 | 1,290 |
| 11-15-52 | 6,622 | 7,096 | 266,662 | 3,425 | 123,313 | 1,556 | 119,148 | 1,236 | 51,942 | 752 | 1,100 |

Source: Data for last two months from API; prior monthly data from Bureau of Mines.



# Drilling Must Expand to Meet Demands, Baker Tells API

**Further expansion in U. S. drilling activity in the years ahead will be necessary to find the huge quantities of new oil and gas that will be needed. And to assure this essential development, special efforts must be made to hold down the hitherto skyrocketing costs of drilling, with wells going deeper and greater proportions of them proving unproductive.**

That the industry faces this challenge was pointed out at the annual meeting of the American Petroleum Institute in Chicago November 11 by Warren L. Baker, Houston, editor of WORLD OIL.

The need for a reduction in drilling costs is one of the most urgent problems confronting the industry, he said, and concerted wide scale efforts to achieve greater efficiency and economies have become imperative.

Lower drilling costs would encourage the drilling of enough wells to discover sufficiently large quantities of new oil and gas to meet the increased requirements of the future, he added.

"It soon will be necessary to discover an average of 4 billion barrels of new oil annually to maintain sufficient capacity to satisfy enlarged producing requirements," Baker stated. "Such huge discovery rates never have been maintained in the past. Just 10 years ago, the discovery of less than 2½ billion barrels yearly was adequate.

"Meanwhile, the amazing growth in natural gas production in this country is reaching such proportions that natural gas discovery needs must be added to those of oil. Future producing rates will be too large to depend entirely on the accidental discovery of gas while searching for oil to provide ample supply, as in the past."

Large additional supplies of petroleum and natural gas remain to be discovered in this country, declared Baker, as attested convincingly by the fact that discovery rates have been boosted during recent years to the highest levels in history. More new oil reserves have been proved up in the past five years than in any previous similar period. This achievement was made possible by increasing drilling and wildcatting to new all time high levels. However, the unprecedented drilling volume entailed increasingly burdensome drilling costs. The industry's expenditures for drilling have become alarmingly heavy because of several factors, including the necessity of drilling deeper and the necessity of sharply increasing exploratory drilling, which has resulted in relatively high proportions of dry holes and lower proportions of productive wells among the total drilled.

"The need for drilling more wells, including more wildcats, confronts the industry with a terrific financial burden," Baker declared. A very substantial increase in drilling costs per well, added to the increase in number of completions, calls for a much greater monetary expenditure for drilling than ever before, he said. "Drilling costs are reaching a point where companies and individuals are discouraged from risking their capital in so hazardous a venture."

Increases in costs for drilling have taken place despite great drilling progress and reductions in footage prices received by rotary drilling contractors. Far more footage is drilled per month by the average rig today. In the first half of 1953, the average rig penetrated 3360 feet per month, or two thirds more than the 1993 feet averaged in 1947. Rotary drilling contractors now receive about one percent less per foot than in 1952 and 1951 and three percent less than in 1948.

Nevertheless, drilling costs have increased, Baker continued. "Many factors have contributed to the increased cost of completing wells. Labor and equipment costs are much higher, wells are drilled deeper, a larger portion of the wells are of the exploratory type, and many new and helpful logging, testing, and coring services are in wider use.

"No reduction in contractor prices, nor in labor and equipment costs seems probable in the near future," said Baker, "so the answer does not lie in these phases.

"The solution lies in providing faster penetration rates, less troublesome holes, and a reduction in time spent in non-penetrating operations. Progress along these lines can be achieved through improved techniques, methods and tools, and in better planning, programming and supervision. Advancements of this nature would reduce the cost of both contractors and oil producing companies. Cutting of a single day off the average completion time would constitute a substantial saving on the large number of wells needed during future years; and if three days can be trimmed from the average completion time, a great sum would be made available for drilling additional wells.

"Aside from paring drilling costs, much can be accomplished by eliminating the drilling of unnecessary wells. A vast sum still is spent in drilling unnecessary wells, despite substantial reduction.

"The economic waste (money, labor, and materials) resulting from drilling, equipping, and operating unnecessary wells in Texas is tremendous," stated Baker. "From Jan. 1, 1947, to Aug. 1, 1952, the yearly average number of exceptions granted to Texas well spacing regulations was more than 1600. The amount spent on unnecessary wells could better be used to wildcat or extend development. Surely the time has come to adopt a program which would avoid this expense.

"Particular attention needs to be paid to the cost of drilling wildcat wells, because these are the most expensive of all wells. The average cost of drilling wildcats probably is somewhere around 50 percent greater than for field development wells. With wildcats now comprising nearly one-fourth of all drilling, they are responsible for the expenditure of vast sums annually. This is a prob-

# 354

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lem which requires the joint effort of geologists and drilling personnel.

"High drilling costs and the need to discover larger quantities of oil also create a need for improved production techniques and practices. Discovery trends can be altered by greater ultimate recoveries. Increased use of unitization and fluid injection methods would be of much assistance in boosting ultimate recoveries, while intensive research might show how to further improve recovery yields.

"A concerted wide scale study of the whole drilling problem is demanded. Fortunately, an increasing number of companies are becoming aware of the problem and are attacking it. From these efforts should come developments which will reduce the cost of drilling and completing wells.

"Even when better techniques and tools offer reduced costs," Baker added, "individual companies can achieve more through proper planning, programming, and supervision. Closer cooperation between contractors and companies would help to eliminate many lost motions which cost time, the basic key to reducing drilling expenses. With drilling constituting such a large portion of all production expenditures, the best supervision is cheap insurance."

## Transportation Given a Hand for Industry Contributions

**Highly efficient transportation in the petroleum industry deserves a large share of credit for the industry's ability to sell its products to the public at comparatively low prices, though price wars and other problems have been involved sometimes in passing the benefits of economies and progress on to the oil consuming public.**

This opinion was expressed by A. A. Stambaugh, chairman of the board of Standard Oil Company (Ohio) at the annual meeting of the API in Chicago November 9.

Under the pressure of competition, the industry's transportation system is constantly shifting toward improved methods, made possible by advancing technology and increasing volumes, he stated.

"Improvement in the means and methods of transportation, probably as much as any fact, explains why our industry today is able to serve the public with a far better product at approximately one half the cost, measured in terms of commodities, that prevailed 30 years ago," said Stambaugh.

Factors in the improvement of transportation and lowering of transportation costs include the modern tanker, the large capacity pipe line, and the product pipe line, made possible by modern welding.

These new and changing methods of transportation have had an important effect on our economy and have created problems, especially in the field of distribution.

Changes in the field of distribution bring changes in prices, said Stambaugh, and price revisions are based ultimately on the economic forces and not upon arbitrary decisions of oil company managements. The price wars and other changes are caused, he said, by the "natural pressures growing out of the stresses and strains of progress."

"Enlightened management has more and more come to realize that the long range interest of a company is identical with that of the public," Stambaugh said, "and what is good for one is likewise good for the other. Decisions made from day to day in the interest of good business accordingly contribute toward a better job for the public."

In order to survive, he continued, members of the petroleum industry must constantly adapt themselves to changes growing out of normal economic trends in the direction of lower costs and lower prices.

Stiff competition, including price wars, must continue so long as America is a land of opportunity, Stambaugh declared. "Soft competition," he said, "is un-American." He called laws such as "fair trade" acts unnecessary "unless we somehow have lost that energy and that ingenuity which have made this country what it is.

"Freedom of opportunity requires that the road be kept open for everyone who believes that he can do a better job for himself and the public.

"Price wars are different only in degree from normal adjustments which are constantly taking place from day to day in any market.

"It is their severity which is unfortunate. They are the corrective mechanism by means of which a market adjusts itself to any new forces. These new forces often grow out of a new and cheaper source of supply, where transportation plays the important part. Again, price wars may develop where someone has a new and improved method of distribution—or thinks he has—by which he seeks to pass on part of his supposed advantage to the public . . . Such attempts are socially commendable, and typical in our economy."

## LPG Pipe Line Expansion Forecast

**Greatly increased quantities of propane and other LPG products will be transported in the early future by long distance products pipe lines. This prediction was made November 10 at the American Petroleum Institute annual meeting in Chicago in a paper by J. W. Boyd, J. O. Richardson, and D. A. Reach of Phillips Pipe Line Company, Bartlesville.**

That company has transported propane as a finished product in its 950 mile products pipe line from Borger, Texas, to East Chicago, Ind., since June 26, 1952.

Wholesale participation of the products pipe line industry in transporting propane is not foreseen. But some systems are geographically located to connect large sources of LPG products with concentrated markets, and these systems will be called upon to regularly carry propane and other LPG products.

The speakers stated that production of LPG products is growing constantly. They cited as one example the fact that internal combustion engines used 28 percent more LPG as fuel in 1952 than in 1951.

Underground storage in caverns or mines will help to reduce the high cost of conventional storage of propane to the shippers, it was stated.

# California to Resume Offshore Well

**California is due to have its first real offshore operation under way again, following the halting of the Seal Beach field project by a law suit. Operations so far have consisted mainly of building an island for a well (WORLD OIL, July 1, 1952, page 112). Work on the island now is starting up again. Operators plan to drill the first well vertically and to test all horizons to basement. Findings in the first well will determine the future island construction program.**

The California Supreme Court has denied the petition of appeal of the City of Seal Beach in its suit to establish jurisdiction over contiguous submerged ocean lands within the three mile limit. The decision gives Monterey Oil Company and The Texas Company freedom to proceed with construction of their drilling island 1½ miles off Seal Beach, and to engage in subsequent drilling operations from the site that will thoroughly test their joint 1400-acre state lease.

At mid-November, equipment was being moved in, and work on the island was due to be resumed promptly. It will probably take about three months to complete the site, immediately after which the first well will be spudded.

Choice of the island location followed some interesting exploratory drilling that was done approximately five years ago. Monterey drilled a number of wells from an upland location at that time, one of which, State 2, was carried directionally to a total footage of 12,131 feet, with an actual vertical depth of 5772 feet. The derrick was situated inland 2400 feet from the water's edge, and the well was bottomed 7500 feet offshore, the deviation of the hole from vertical at times reaching as high as 80 degrees.

The producing interval of this well is directly in line with the easterly trend of the Wilmington field. Since completion, it has consistently yielded about 30 barrels a day of 26 degree gravity oil, and extensive coring and geological studies indicate that this production comes from the Ford Pool. The island site well will be drilled vertically and will test the whole sequence of producing horizons normally encountered in the Wilmington field.

# Attractive Lease Regulations Urged

**Leasing regulations must be made attractive to operators in order to promote maximum exploration and development of the continental shelf and the government owned lands of the Rocky Mountain states. This conclusion was made in two separate papers delivered at the annual meeting of the American Petroleum Institute in Chicago.**

Clayton L. Orn of The Ohio Oil Company, Houston, speaking on offshore development problems, advocated "a spirit of cooperation, confidence, and mutual understanding" among states, the federal government, and the industry for maximum development of the offshore petroleum resources.

"The unfavorable and burdensome provisions of some leases on the uplands, if written into offshore leases, will deter the operators in taking the risks incident to producing oil in the open sea," Orn said.

"Whether offshore oil can compete with uplands oil will depend to a great extent upon technological developments, economic conditions, and the rules and regulations promulgated by the state and federal agencies.

"Each lease sold by a state or by the federal government on submerged lands must be sold in competition with leases on the uplands."

Orn warned that finding and producing oil from the continental shelf "is not the bonanza some have represented it to be," and he said that "the costs will be great; the hazards even greater." However, he added, the oil industry will not be discouraged.

Speaking on operations on federal lands in the Rocky Mountains, L. J. Putnam of Gulf Oil Corporation, Denver, said acreage limitations represent one of the most difficult problems confronting operators.

"The oil and gas leasing act . . . and the federal regulations . . . generally limit the taking or holding of oil and gas leases or interests . . . by a person, corporation, or association to 15,360 acres and 100,000 acres under two year non-renewable geological or geophysical options in each state," Putnam said.

# Up and Atom

**Amendment of the atomic energy act of 1946 to encourage industry cooperation with government in developing atomic energy has been advocated by Dr. Charles Allen Thomas, St. Louis, president of Monsanto Chemical Company.**

Governmental restrictions upon industry make business tend to shy away from atomic energy, he said, but it is the responsibility of industry to work with the government in getting the best possible atomic energy law.

Unless private industry takes the initiative in developing peaceful uses of atomic energy, the leadership in this field may be lost to other countries, Thomas declared at the API annual meeting in Chicago.

"It was unfortunate that we had to start the Atomic Age under secrecy and government monopoly," he asserted. "The question is then, by 1975, will this new science bring more freedom, more industry, more profits to individuals and to industry, or will it do just the reverse and give more power to the state, which brings with it more controls, more regimentation, more loss of individual freedom?

"Now is the time to answer this question, for the framework of the future is being fabricated at the present moment. Let us hope that industry and all thinking people will not fail to answer the question—by default."

Thomas pointed out that no one knows just what Russia is doing, but there is plenty of evidence that her atomic-energy technology has advanced far more rapidly than people in this country thought possible.

"It would be nothing short of tragic for the U. S. to be a leader in military atomic energy and then lose the initiative on the peaceful side to another part of the world," he warned.

## U. S. Wells Completed in October and First Ten Months, 1953

| STATE or DISTRICT | NEW WELLS COMPLETED AND FOOTAGE DRILLED | | | | | | | | | | | | | | | Rigs in Operation | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Oil | Dist. | Gas | Dry | Water Input | Gas Input | Water Disposal | TOTAL NEW WELLS Oct., 1953 | Sept., 1953 | Oct., 1952 | Total Footage October, 1953 | DETAILS FOR JANUARY-OCTOBER New Wells 1953 | 1952 | Percent Diff. | Footage 1953 | 1952 | Oct. 31, 1953 | Sept. 30, 1953 | Oct. 31 1952 |
| Alabama | 2 | | | 8 | | | | 10 | 9 | 8 | 46,014 | 89 | 56 | + 58.9 | 459,522 | 338,600 | 7 | 7 | 6 |
| Arizona | | | | | | | | | | 1 | | 6 | 2 | +200.0 | 19,960 | 10,755 | 1 | 1 | 3 |
| Arkansas | 24 | 1 | 2 | 35 | | | | 62 | 54 | 50 | 269,097 | 429 | 355 | + 20.8 | 1,589,947 | 1,344,911 | 48 | 53 | 36 |
| California | 207 | | 6 | 56 | | | | 269 | 188 | 197 | 1,258,067 | 2,183 | 2,060 | + 6.0 | 9,531,867 | 8,749,279 | 261 | 259 | 242 |
| Colorado | 25 | | 3 | 30 | | | | 58 | 65 | 61 | 316,593 | 573 | 390 | + 46.9 | 2,954,392 | 2,081,580 | 72 | 60 | 49 |
| Florida | | | | 1 | | | | 1 | 5 | 1 | 5,075 | 29 | 7 | +314.3 | 185,437 | 45,407 | 3 | 3 | 2 |
| Georgia | | | | 2 | | | | 2 | 1 | | 5,533 | 7 | | | 19,309 | | 2 | 3 | 1 |
| Idaho | | | | | | | | | | | | 4 | | | 22,748 | | | 2 | 3 |
| Illinois | 134 | | | 140 | | | | 274 | 190 | 226 | 734,080 | 1,737 | 1,735 | + 0.1 | 4,345,723 | 4,279,256 | 254 | 245 | 201 |
| Indiana | 43 | | | 60 | 2 | | | 105 | 120 | 118 | 166,744 | 1,086 | 1,074 | + 1.1 | 1,830,035 | 1,915,946 | 182 | 162 | 162 |
| Kansas | 137 | | 19 | 161 | | | 5 | 322 | 329 | 392 | 1,123,394 | 3,779 | 3,589 | + 5.3 | 13,101,071 | 12,452,493 | 435 | 430 | 410 |
| Kentucky | 41 | | 15 | 49 | | 1 | | 106 | 115 | 100 | 189,407 | 987 | 985 | + 0.2 | 1,931,720 | 2,009,480 | 91 | 95 | 102 |
| Louisiana | 154 | 4 | 33 | 89 | | | | 280 | 256 | 252 | 1,764,621 | 2,163 | 1,979 | + 9.3 | 15,158,399 | 13,181,269 | 270 | 266 | 225 |
| North Louisiana | 91 | | 17 | 40 | | | | 148 | 116 | 143 | 466,075 | 953 | 1,091 | — 12.7 | 3,461,945 | 4,221,481 | 64 | 59 | 61 |
| South Louisiana | 63 | 4 | 16 | 49 | | | | 132 | 140 | 109 | 1,298,546 | 1,210 | 888 | + 36.3 | 11,696,454 | 8,959,788 | 206 | 207 | 164 |
| Maryland | | | 1 | | | | | 1 | | | 4,101 | 5 | 32 | — 84.4 | 19,715 | 124,967 | 1 | 1 | 6 |
| Michigan | 22 | | 2 | 36 | | | | 60 | 50 | 54 | 153,556 | 508 | 540 | — 5.9 | 1,315,955 | 1,460,241 | 97 | 117 | 90 |
| Mississippi | 27 | | 2 | 24 | | | | 53 | 29 | 25 | 352,708 | 340 | 284 | + 19.7 | 2,346,034 | 2,037,035 | 34 | 43 | 37 |
| Missouri | | | | | | | | | 8 | | | 25 | 29 | — 13.8 | 20,645 | 30,090 | 1 | | 3 |
| Montana | 20 | | 2 | 21 | | | | 43 | 64 | 47 | 186,571 | 369 | 245 | + 50.6 | 1,611,706 | 855,882 | 41 | 57 | 66 |
| Nebraska | 5 | | 2 | 12 | | | | 19 | 33 | 39 | 97,473 | 274 | 212 | + 29.2 | 1,419,871 | 1,058,412 | 15 | 18 | 18 |
| Nevada | | | | | | | | | 1 | | | 8 | | | 11,115 | | 1 | | 1 |
| New Mexico | 43 | | 52 | 29 | | | | 124 | 142 | 91 | 681,005 | 1,227 | 926 | + 32.5 | 6,940,010 | 5,121,217 | 168 | 178 | 180 |
| New York | 50 | | | | 31 | | | 81 | 80 | 99 | 113,011 | 772 | 906 | — 14.8 | 1,076,900 | 1,257,430 | 107 | 105 | 121 |
| North Carolina | | | | | | | | | | | | 1 | | | 1,570 | | | | |
| North Dakota | 14 | | 9 | | | | | 23 | 25 | 18 | 157,301 | 212 | 60 | +253.3 | 1,575,978 | 523,968 | 31 | 32 | 29 |
| Ohio | 32 | | 17 | 35 | | | | 84 | 75 | 103 | 157,459 | 805 | 809 | — 0.5 | 1,640,341 | 1,745,381 | 195 | 189 | 171 |
| Oklahoma | 361 | | 35 | 214 | 2 | | 1 | 613 | 605 | 466 | 2,112,330 | 6,002 | 4,724 | + 27.1 | 21,098,171 | 17,815,348 | 568 | 596 | 561 |
| Pennsylvania | 65 | | 13 | 5 | 54 | 11 | | 148 | 127 | 138 | 260,971 | 1,360 | 1,413 | — 3.8 | 2,350,006 | 2,390,473 | 271 | 244 | 246 |
| South Dakota | | | | 2 | | | | 2 | | 2 | 9,352 | 16 | 5 | +220.0 | 79,610 | 20,531 | 5 | 3 | 1 |
| Tennessee | | | | | | | | | 1 | | | 1 | | | 2,269 | | | | 5 |
| Texas | 821 | 26 | 77 | 588 | 12 | 3 | 2 | 1,529 | 1,328 | 1,332 | 6,827,095 | 14,069 | 14,912 | — 5.7 | 64,352,690 | 71,552,751 | 1,375 | 1,327 | 1,381 |
| Dist. 1 South Central | 55 | | 1 | 40 | | | | 96 | 72 | 98 | 289,412 | 710 | 664 | + 6.9 | 2,272,380 | 1,950,520 | 38 | 28 | 46 |
| Dist. 2 Middle Gulf | 22 | 1 | 17 | 25 | | | | 65 | 66 | 72 | 391,067 | 651 | 685 | — 5.0 | 4,009,710 | 4,363,214 | 51 | 38 | 46 |
| Dist. 3 Upper Gulf | 59 | 7 | 10 | 55 | | | | 131 | 145 | 126 | 857,067 | 1,365 | 1,485 | — 8.1 | 9,196,179 | 9,760,467 | 129 | 138 | 142 |
| Dist. 4 Lower Gulf-S.W. | 74 | 15 | 14 | 73 | | | | 176 | 134 | 121 | 954,105 | 1,556 | 1,362 | + 14.2 | 8,892,794 | 7,192,160 | 89 | 100 | 122 |
| Dist. 5 East Central | 6 | | 1 | 9 | | | | 16 | 16 | 29 | 67,156 | 231 | 304 | — 24.0 | 932,292 | 1,513,448 | 13 | 11 | 20 |
| Dist. 6 Northeast | 16 | | 11 | 19 | | | | 46 | 47 | 30 | 274,167 | 417 | 442 | — 5.7 | 2,500,095 | 2,717,683 | 51 | 51 | 43 |
| Dist. 7-B North Central | 148 | | 2 | 137 | 1 | | | 288 | 249 | 212 | 924,315 | 2,611 | 2,290 | + 14.0 | 8,464,031 | 7,222,875 | 130 | 174 | 116 |
| Dist. 7-C West Central | 60 | 2 | | 42 | | | | 104 | 81 | 157 | 527,129 | 1,115 | 1,774 | — 37.2 | 5,487,188 | 10,490,535 | 145 | 130 | 162 |
| Dist. 8 West | 186 | 1 | 1 | 56 | 1 | | | 245 | 197 | 194 | 1,373,255 | 1,930 | 2,743 | — 29.6 | 11,092,243 | 16,149,162 | 350 | 344 | 343 |
| Dist. 9 North | 164 | | 1 | 131 | 10 | 3 | 2 | 311 | 269 | 276 | 1,000,700 | 3,041 | 2,671 | + 13.9 | 10,122,054 | 8,617,660 | 271 | 227 | 266 |
| Dist. 10 Panhandle | 31 | | 19 | 1 | | | | 51 | 52 | 17 | 168,722 | 442 | 492 | — 10.2 | 1,383,724 | 1,575,027 | 108 | 86 | 75 |
| Utah | 2 | | 3 | 4 | | | | 9 | 3 | 9 | 40,387 | 67 | 64 | + 4.7 | 365,196 | 416,119 | 24 | 21 | 27 |
| Washington | | | | | | | | | | | | | | | | | 1 | 1 | |
| West Virginia | 3 | | 40 | 7 | | | | 50 | 46 | 41 | 142,033 | 516 | 484 | + 6.6 | 1,442,946 | 1,444,289 | 210 | 215 | 185 |
| Wyoming | 75 | | 3 | 18 | | | | 96 | 96 | 73 | 516,430 | 690 | 523 | + 31.9 | 3,485,154 | 2,643,861 | 168 | 146 | 89 |
| Total United States | 2,307 | 31 | 327 | 1,635 | 101 | 15 | 8 | 4,424 | 4,045 | 3,943 | 17,690,728 | 40,339 | 38,400 | + 5.0 | 162,306,012 | 156,906,971 | 4,939 | 4,879 | 4,659 |
| Total Western Canada | 91 | | 15 | 86 | | | | 192 | 168 | 192 | 827,712 | 1,804 | 1,571 | + 14.8 | 7,477,008 | 6,468,592 | 167 | 184 | 171 |

# Completions Bounce Back

### New monthly all-time high of 4424 wells reached after decline in September.

After Declining slightly in September, well completion rates bounced back in October to set a new all-time monthly record. The new mark of 4424 new wells topped the previous peak reached in August of this year by the scant margin of nine wells.

Total wells completed in the first 10 months of this year numbered 40,339. That was also a new all-time mark for the period. Compared with last year's 10-month period, new wells have been more numerous by 1939 or 5 percent.

The amount of footage drilled in this year's wells has totaled 162,306,012 feet, and that exceeded last year's 10-month total by 3.4 percent. Five percent more wells have accounted for only 3.4 percent more footage, which means that on the average this year's tests have been slightly more shallow. So far this year, wells have been drilled to the average depth of 4024 feet, while a year before each had been 4086 feet deep on the average.

Of all the wells drilled for oil or gas production this year—which excludes service wells—20,779 have been completed as oil producers. Oilers have accounted for 52.9 percent of the total drilled, while a year earlier the count had been 19,741 oil wells or 53.0 percent of all tests.

Gas-distillate producers have totaled 303 or 0.8 percent this year and a year earlier 299 had amounted to exactly the same percent of the total. Natural gas wells have been somewhat more numerous this year than last. A total of 3005 have been drilled for a score of 7.6 percent of the total, and a year ago the tally had been 2654 gassers or 7.1 percent.

A slight edge in the dry hole score has been attained by this year's drilling campaign over last year's. In 10 months a total of 15,194 wells ended as failures. That was more than the 14,586 recorded in the same period of 1952, but the advantage lies in the score of 38.7 percent of total drilled, while the best done in 1952 was 39.1 percent.

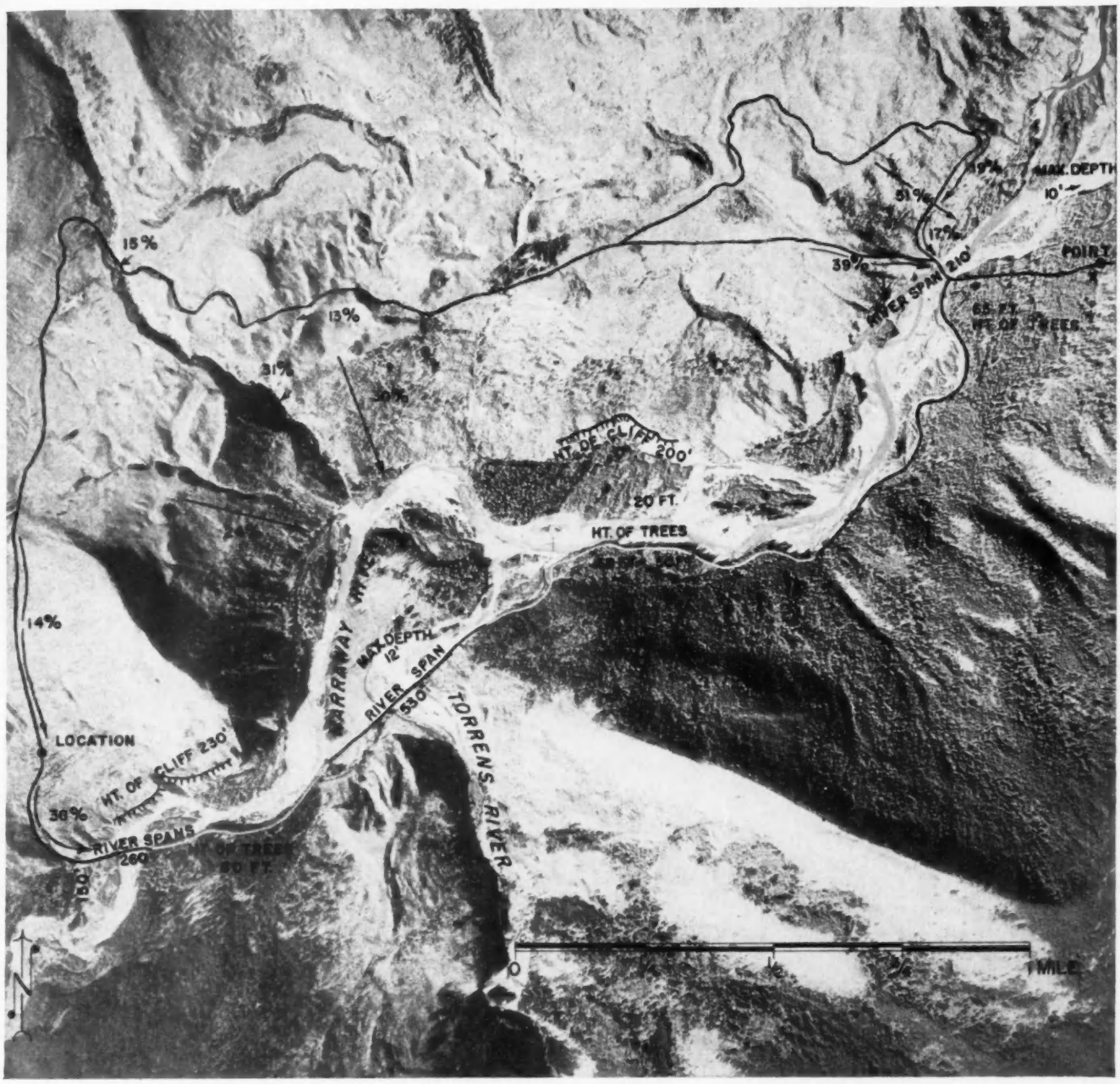


Fig. 1—Aerial photograph illustrates a typical access road problem, together with answers obtained by stereoscopic analysis and application of photogrammetry. Two alternate routes, each designed for a specific type of work and season of year in which it is to be done, are shown for road between point X at upper right, and Location, at lower left. Note that accessibility of area is complicated by deeply incised rivers, large muskeg areas and dense vegetation.

# Accessibility Surveys Cut Costs

**Backtracking by road-building crews in Canadian wilderness is reduced by a modern approach to a major problem confronting exploration parties.**

**By P. H. BLANCHET, B. KAVANAGH and F. E. PREBBLE,** Blanchet & Associates, Calgary

ACCESSIBILITY HAS become a major and costly problem for many oil companies operating in Western Canada. Here, frontiers of intensive oil exploration have been pushed back to include vast regions in which muskeg, dense forests and rivers present formidable obstacles, making the job of locating and constructing access roads extremely difficult. And that adds considerably to the cost of exploration.

**Fig. 2**—Aerial photograph shows a typical accessibility survey. Fine, straight, unbroken lines represent ideal grid pattern requested by company geophysicists. Work road routes are those selected by photogrammetrist. Proposed roads follow ideal grid as closely as is feasible, consistent with type of operations, maximum grades and seasons in which work is to be done. Also indicated by photogrammetrist are escarpments, grades, muskeg areas, ford, proposed landing strip area, and camp site.

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Because of the sparse settlement of these regions, very little adequate mapping is available, and that which is indicates little of the nature of the terrain, topography and ground conditions, and nothing of the seasonal climactic changes and other factors of prime importance to companies planning exploration programs.

Accessibility surveys, consisting basically of the stereoscopic analysis of aerial photographs by competent, specially trained photogrammetrists, afford a ready means of resolving most of these problems. They are a means of predetermining the most practical routes of access into, and within, an exploration area.

For the planner of field operations, this survey gives a comprehensive picture of the accessibility problems, together with an analysis of the probable conditions that will prevail at different seasons of the year. Thus, it enables him to know in advance the type and amount of road building equipment and materials required, and to closely estimate the time and cost to complete necessary roads. To obtain the same information from a ground reconnaissance would involve weeks or months of time and considerable expense.

Accessibility surveys, by increasing over-all efficiency of field operation during both planning and operational

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*Photo by Robert Needham*

**LOW ALTITUDE** oblique photograph shows dense forest, small muskeg areas, and topographic conditions in same region as that shown in Figure 2.

phases and by reducing the field time of crews and equipment, pay for themselves many times over.

A major oil company, which has operated in Western Canada for many years, estimates that such surveys, intelligently executed and properly put into effect by specially trained personnel, reduce road building costs by as much as 40 to 50 percent. Since the accessibility survey cost, including that of the existing aerial photographs, is generally les than ten percent of the road building costs, it does not take the saving of very many miles of road or very many days of road construction, through good planning, to pay for the survey.

**Types of Surveys.** Accessibility surveys are of two types.

- One is concerned with determining the most feasible and practical route for an access and service road from an existing road into an area or well location.
- The other is concerned with the accessibility of an exploration area and with the work roads to be constructed, which for seismic and core hole programs are generally laid out in grid patterns.

These surveys usually are presented in the form of annotated stereoscopic strip mosaics, suitably bound, folded and waterproofed for field use. The stereo-view if of considerable value to field personnel. It enables them to recognize landmarks more readily and to follow the routes recommended. The stereo-view of these mosaics is obtained by means of a simple field stereoscope and a booklet containing the photos alternate to those used to construct the mosaics.

Accompanying the strip mosaics is a descriptive report setting forth all relevant information and observations not indicated on the mosaics. Also given is an analysis of the change of conditions to be expected in different seasons.

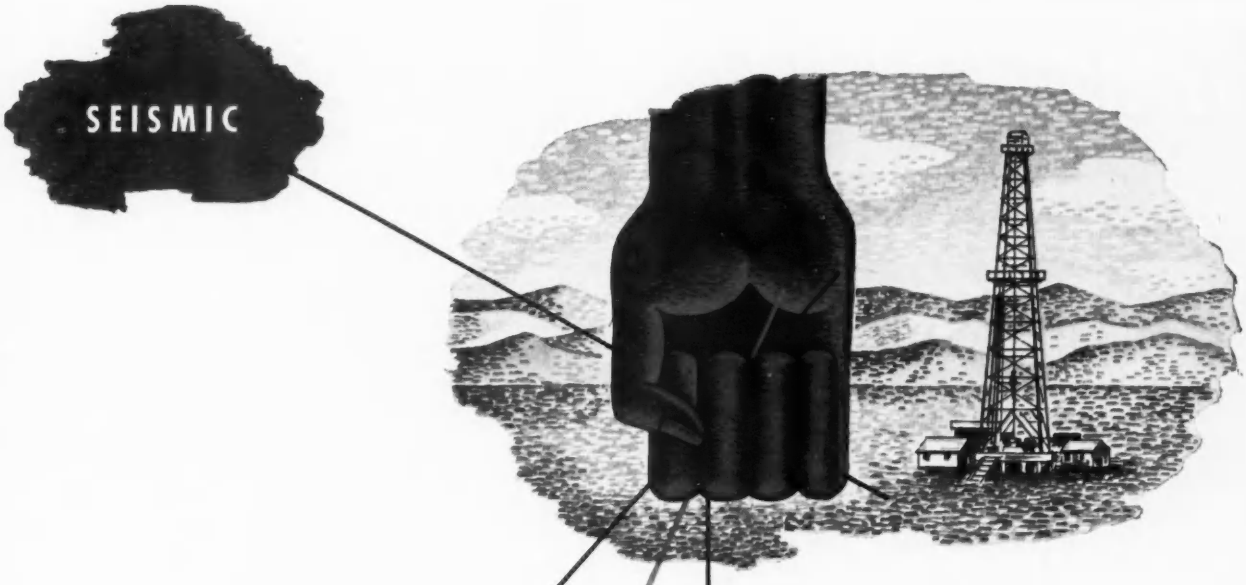
**Access Road Survey.** The aerial photograph, Figure 1, shows a typical access road problem and answers obtained by a stereoscopic analysis of the aerial photographs and the application of photogrammetry. The problem is to reach a well location, indicated on the left side of the figure, from point X on the right side.

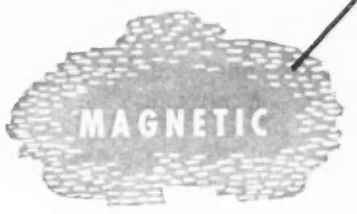
The expert photogrammetrist, by means of a stereoscopic examination of the aerial photographs and special photogrammetric instruments, is able to measure the dimensions of pertinent topography and other features shown in Figure 1. After an analysis of what he can see and measure, and knowing the specifications of the road required (winter or summer or year-round operations, maximum allowable grades, etc.) he is in a much better position to select the most practical and economical route than is the person who has only a planimetric map.

Figure 1 shows two alternative routes. The report which would accompany this survey would recommend that the route along the river's edge be followed if the road is required only for winter use, but that the route along the high ground be followed if the road is required for summer or year-round operations. The report would discuss reasons for these recommendations, giving consideration to such factors as winter ice conditions and spring floods.

To plan even this small portion of the route (point X is actually 26 miles from the nearest road) without the aid of an accessibility survey would involve considerable field reconnaissance. With only a planimetric map, field reconnaissance would involve more time and cost than the six hours required by a photogrammetrist to complete the access survey here shown, together with the comparatively negligible cost of existing aerial photographs.

**Area Accessibility Survey.** The aerial photograph, Figure 2, illustrates an accessibility survey of a portion of a typical exploration area. Clearly shown by fine, straight, broken lines is the ideal grid pattern requested by the company's geophysicist. This grid has been moved by the photogrammetrist to best fit this particular area—to miss as many of the natural obstacles as possible. Also to be seen are the work roads selected



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and recommended by the photogrammetrist. These follow the ideal grid as closely as is feasible and practical, consistent with the specifications stipulated by the company: year-round operations and no long grades over 20 percent.

Accessibility of this area is complicated by large muskegs, deeply incised rivers and dense vegetation. It is further complicated by fairly rugged topography, which cannot be fully appreciated by the reader without the aid of the stereoscopic view. To make the topographic obstacles and landmarks more apparent to the road-building crew, which would be using this accessibility survey as their guide, the photogrammetrist has annotated these features on the photograph with appropriate symbols. By request of the company, he has also shown his recommended location for a landing strip and camp site.

With nothing more than a planimetric, small-scale map as a guide, a bulldozer crew would be essentially blind. Figure 3, a low altitude aerial oblique photograph of the region shown in Figure 2, offers some idea of what would confront them. If the bulldozer proceeds to cut road through the dense forest without a ground reconnaisance party out ahead, the resulting road will reflect this blindness.

Muskeg, steep slopes, river banks and terraces will force backtracking and re-routing frequently. Even with a reconnaisance party scouting in front of the bulldozer, it is still difficult.

For example, in Figure 2, consider the reconnaissance of the work road following profile Line 1 from A to B. Point A is a recognizable point on the map and the reconnaissance party knows that to follow this profile line to point B, travel must be done on a bearing of S30° W for a distance of one and a half miles. At A, they are immediately confronted with what appears to be an inaccessible escarpment. Because of the dense forest, considerable scouting is required to find that the eastern edge is accessible, with a grade no greater than 4 per cent.

Once up on the river terrace and on line again, they are able to travel on bearing for one mile without obstacles. However, at Point C they find themselves on the edge of another inaccessible escarpment. To them, the obvious solution appears to scout east and south. This brings them onto a lower terrace, but they are still prevented from reaching B by another escarpment. Starting again at C, they then would probably follow the crest of the first escarpment to the southwest. Again they are brought up short at point D.

In contrast, the only solution was readily determined by the photogrammetrist by bearing N 60° W from C, through the low pass in ridge at E, thence southward to the first escarpment where a break occurs, and from there Point B is easily reached.

Accessibility surveys are of definite practical assistance to oil companies and exploration groups operating in regions not accessible by existing roads. Furthermore, these surveys are proving, to those companies making extensive use of them, that they substantially reduce exploration costs and accelerate field operations. Though these surveys do not, perhaps, give complete information on all the controlling factors of accessibility, they can without doubt serve as invaluable guides both to the planner of field programs and to the field personnel responsible for carrying out those programs. **—The End.**

## About the Authors


F. E. PREBBLE was born and educated at Christchurch, New Zealand. After graduating from the Christ Church Technical College, he saw service in World War II with Royal Airforce Pathfinder Force and the Second New Zealand Expeditionary Force. On discharge from the armed forces he joined the Hunting Air Survey Group and was trained as a photogrammetrist at their head office in London, England. From completion of this training until accepting present position, he has been engaged in photogrammetric mapping projects with major companies in Africa, India and Canada.

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B. KAVANAGH was born and educated in England and served with the Royal Artillery during World War II. On cessation of hostilities he joined a research team of photogrammetrists working with the Ordnance Survey and four years later came to Canada in the employ of a major air survey company. In 1952 he joined the co-authors in applying photogrammetry to problems of oil exploration and in 1953 became an associate of Blanchet & Associates.

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P. H. BLANCHET, born in Toronto and reared and educated on the West Coast, graduated in 1943 from the University of British Columbia. He joined Imperial Oil Ltd. to work on the Canol project at Norman Wells. After several years of photogeological and field exploration work in the foothills of Alberta, he was transferred to International Petroleum in Peru early in 1946. There he was engaged in extensive photogeological exploration until 1949 when he left that company to open a photogeological consulting office in Houston with Louis Desjardins. In 1950 he returned to Alberta, where he was employed as assistant manager of Denton-Spencer Company, in charge of exploration consulting. In 1952, he acquired Atlas Mapping & Drafting, Ltd., a company devoted to the construction of petroleum industry maps. At the same time, he organized Blanchet & Associates to carry on photogeological consulting.

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# Surface Minerals Reveal Michigan Structures

**• Mineral alteration studies detect subsurface structures covered by thick glacial drift and therefore unresponsive to geophysical surveys.**

**• The method promises to find Michigan Basin structures more economically than core drilling or random wildcatting.**

**By BERNARD H. LASKY,** Consulting Geologist, Houston

THE UTILIZATION of surface mineralization as a subsurface structural mapping technique has been previously described.[1] The method is based upon the discovery by the writer that the sedimentaries which are clays, or which consist for the most part of clay minerals, have been subjected to alteration at the surface, and that this alteration is regional. Studies of the alteration, which are made on a quantitative basis, have demonstrated that the alteration is a function of the subsurface structural relief. The alteration study, therefore, provides an effective subsurface mapping tool.

Prior to 1950, the use of the alteration study technique had been confined to the Gulf Coast of Texas and Louisiana, to northern and central Louisiana, and to Mississippi. On the basis of this early work, it was assumed that the technique might be successfully employed in other geologic provinces and particularly to problems in exploration which have proven difficult of solution or which could not be resolved by conventional methods.

Since 1950, the alteration study has been utilized to map the subsurface in West Texas, central and southern Oklahoma, Kansas, Illinois, Colorado and Nebraska. This work provides an extensive and diversified background for the evaluation of the technique.

Recently, the technique was applied on an experimental basis to the structural problems of the Michigan Basin. The results of this work would be interesting under ordinary circumstances, but due to the fact it was performed on a "blind" basis, they are particularly significant. A "blind" survey refers to a study in which the location of the area being worked and all information concerning the area are undisclosed to the exploration geologist.

The occurrence of oil and gas in Michigan and the regional geology of the Michigan Basin have been reported by Hake[2] and Addison.[3] The important fact in connection with the use of the alteration study technique in Michigan, however, is that almost all of the lower peninsula of Michigan, which comprises the Michigan Basin, is covered by glacial deposits varying in thickness from a few feet to more than 1000 feet. This mantle of drift has presented insurmountable difficulties to the effective mapping of the subsurface structure of the basin by geophysical and other exploratory methods. Subsurface work, based on random or exploratory drilling and supplemented by the drilling of core tests through the drift, has been responsible for most of the discoveries. As core tests average 800 feet in depth, the cost of this type of exploration is excessive.

For purposes of clarification, a review of the alteration study procedure follows. Samples of the surface beds are taken at a depth of approximately four feet. The samples are analyzed in the laboratory by conventional methods and the amounts of the critical minerals in each sample are determined. The differentials in these control minerals are then plotted with respect to the locations of the sample stations, and graphical representations are obtained in the form of contoured maps. These are actually mineralization maps contoured on quantitative values of the control minerals on an arbitrary datum, but since the relationship between mineralization and the subsurface has been established, a representation of the subsurface structure is thus obtained. Profiling, in which the samples along the profile are spaced ⅓ or ½ mile apart, is generally adequate for preliminary reconnaissance.

Concurrently with the conventional application of the alteration study technique in exploratory practice, certain "blind" surveys were undertaken by the writer on an experimental basis in Texas, Oklahoma, Kansas and Illinois. A portion of this work was done for a research organization for the purpose of evaluating the technique on the basis of "raw" or purely statistical data. These projects were specifically designed to eliminate from the results the effect of the writer's geological experience and knowledge of the area under consideration.

On these projects, samples were submitted to the writer from undisclosed areas. In some instances, the actual locations of the samples with reference to each other were not disclosed. Under such circumstances, raw values were reported and no interpretation of the results was possi-

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ble until the sample locations had been later revealed. No information concerning the local or the regional structure was furnished, and no opportunity to effect a calibration between the data of alteration and a known or type structural condition in the general area was permitted, in order that control for the problem could be established and the relative values of the several mineral parameters which are ordinarily utilized could be determined.

It is obvious that the blind survey subjects the alteration study to a unique standard of performance. No conventional exploration technique can operate on a blind basis which incidentally violates the fundamentals of sound exploration practices. As a result of previous experience with the alteration study technique, however, it was considered that the blind study could be expected to indicate a qualitative if not a quantitative relationship between the data of the study and the actual subsurface structure.

It should be understood that the conventional use of the technique involves the preliminary determination of the relationship between the alteration data and a subsurface condition for any given area. As a result of this calibration, the critical mineral parameters for the area are indicated.

These conditions cannot be fulfilled in the blind study. Under the restrictive handicaps of the blind survey, any interpretation must necessarily be generalized for it cannot be supported by any basic geologic knowledge of the area or by the structural problem involved.

In spite of these disadvantages, the results of these blind surveys have been quantitatively adequate to support the basic theory of the alteration study and to justify its use as a valuable exploration tool.

In the fall of 1952, certain samples were received from an undisclosed area and state for blind study. A plat, indicating the locations of the samples along a continuous profile was submitted with the samples. No additional information was furnished.

On superficial examination, the samples proved to consist entirely of

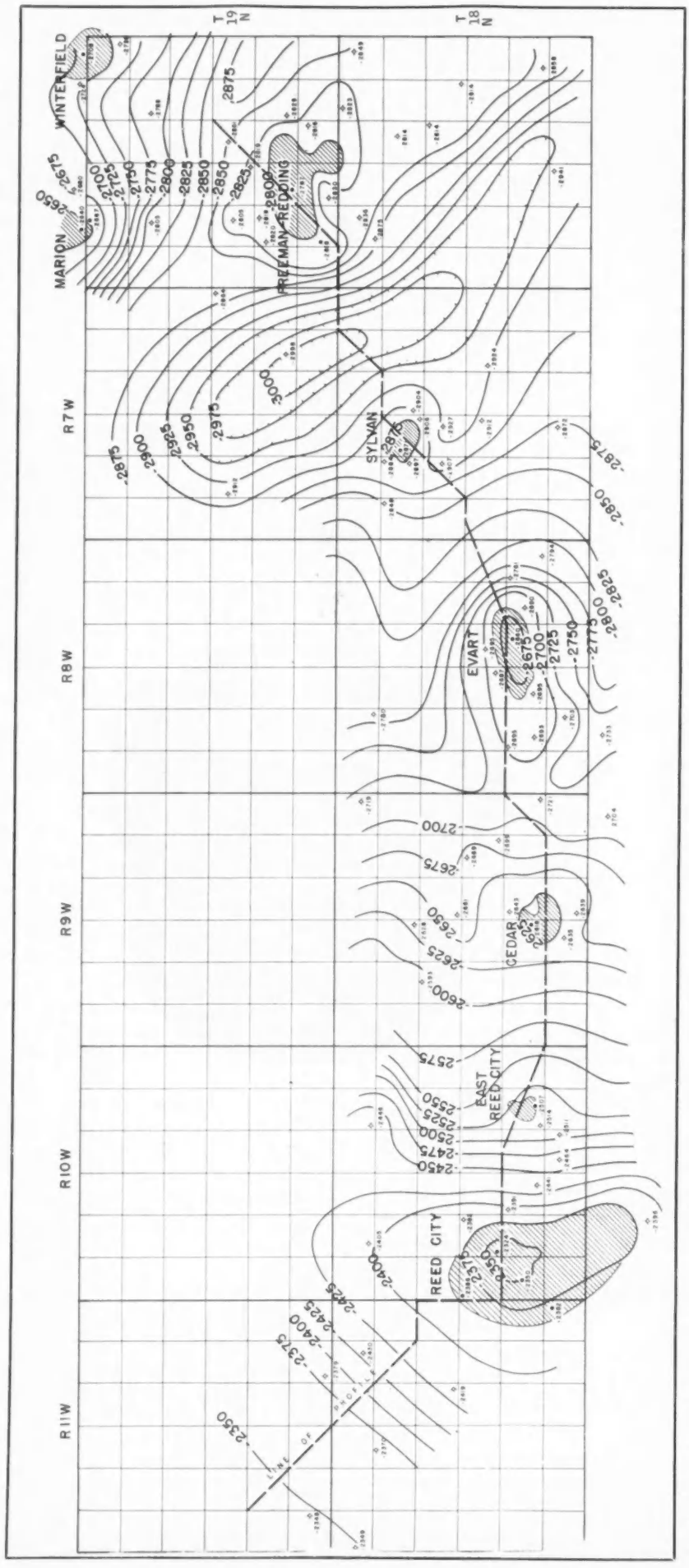


**Fig. 1**—Location of the experimental profile in Lake, Oscrola and Clare counties, Michigan, and the subsurface structure of the area, contoured from well data on top of Dundee limestone. Hatched areas indicate oil-producing areas. Gas production is not shown.

Hatched areas indicate oil-producing areas. Gas production is not shown.

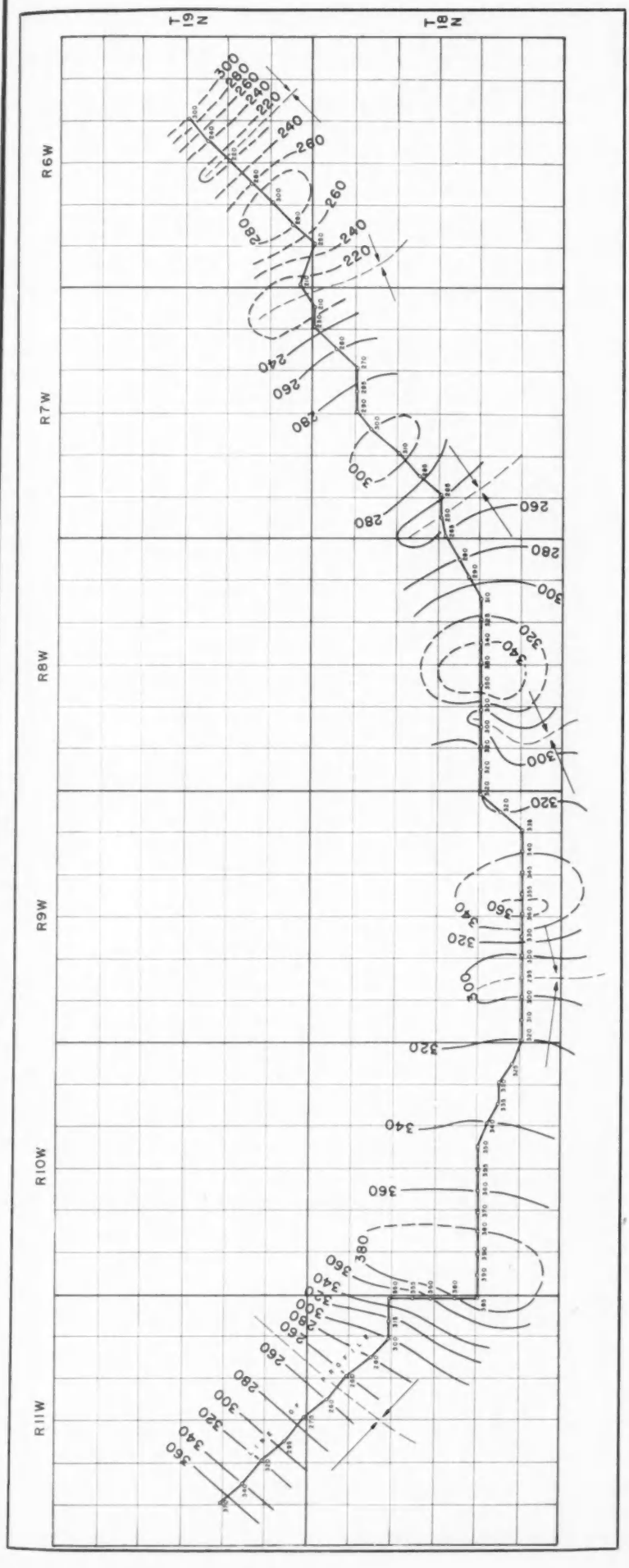


Fig. 2—Interpretation of subsurface structure along the profile based on the alteration data on two control minerals. The structural values for each of the 70 samples taken on the profile are indicated. The contours are on an arbitrary datum.

sands with an absolute minimum of clay material. They were entirely dissimilar to the residual clays and sandy clays on which all previous alteration study work had been performed.

This study was completed and several months later, in the early part of 1953, a second set of blind samples was received which appeared similar in character.

The two projects were reported as independent studies in the absence of any information as to their possible relationship. Subsequent to the report on the second project, it was disclosed to the writer that the projects represented a continuous profile in the Michigan Basin. It is now possible to release the results of these studies and for the purpose of this report, they will be considered and described as one project.

This consisted of a continuous sample profile approximately 36 miles in extent, traversing six townships from west to east in Lake, Osceola and Clare counties, Michigan. The profile started in the southwestern part of T 19 N, R 11 W, extended in a southeasterly direction through T 18 N, R 11 W, in Lake County, turned almost due east into T 18 N, R 10 W through T 18 N, R 9 W and T 18 N, R 8 W, turned northeast into T 18 N, R 7 W, in Osceola County and continued in a northeasterly direction into the center of T 19 N, R 6 W, in Clare County.

The profile crossed the Reed City, the East Reed City, the Cedar, the Evart, and the Freeman-Redding fields.

The location of the profile together with the actual subsurface structure along the profile, contoured from well data on the top of the Dundee Limestone, which produces the major part of Michigan's oil, is shown in Figure 1.

The results of the alteration study are shown in Figure 2. The structural interpretation indicated in Figure 2 is based on the results obtained on two different control minerals which are referred to as Control A and Control B. While the limitations of space do not permit a representation of the results from Control A and Control B independently, there is close agreement between these controls. There are, however, two local areas of difference.

Control A indicates the possibility

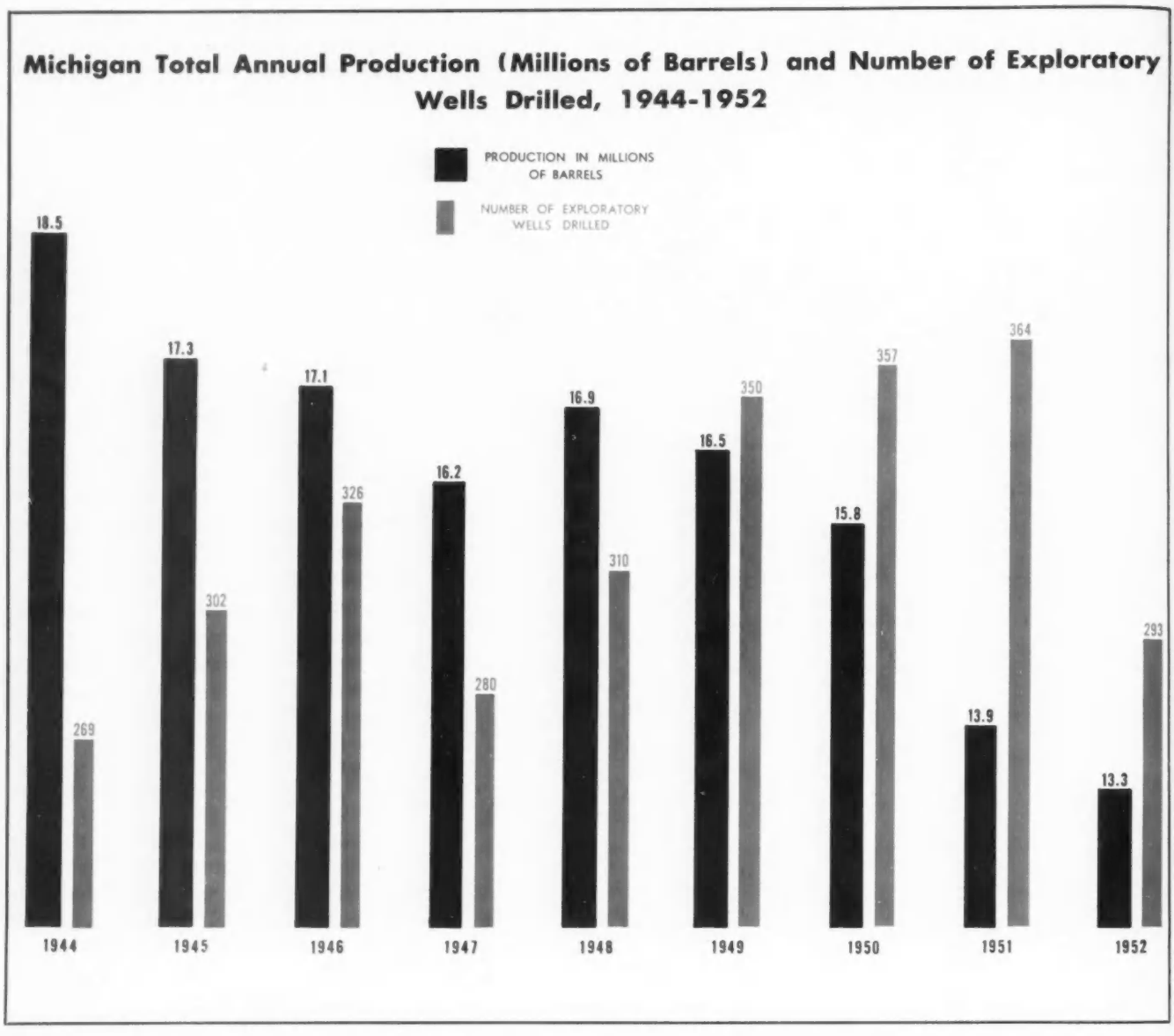


**Fig. 3**—Michigan crude oil production declines despite increased exploratory drilling. Production data from Michigan Department of Conservation, Geological Survey Division. Exploratory well data from Bulletins of AAPG, June issues, 1945-1953.

of a small structure in the northeast corner of T 18 N, R 7 W, between the Sylvan and Freeman-Redding fields. Control B does not show an anomaly in this area. Control A indicates that southwest dip, which is anomalous for this area, exists in T 19 N, R 6 W. Control B shows a definite structure in this area and indicates southwest dip to the northeast of this structure.

Under the conditions imposed upon the survey, no evaluation could be made of the relative importance of the two controls. The profile, however, represents a blind preliminary reconnaissance of the area and it is evident that if the work had not been experimental but had been undertaken on a conventional basis for the purpose of exploring undeveloped territory, all anomalies indicated would be subject to check by supplemental detailed work. The differences indicated, therefore, would be of minor practical importance.

A comparison of the actual subsurface structure along the profile, as shown in Figure 1, with the results of the alteration study as indicated in Figure 2, shows that the study was successful in delineating the subsurface structure of the area of the profile on both a local and regional basis.

The results can be summarized as follows:

- A structure of considerable importance was indicated in the area of the Reed City field. This is in close agreement with the actual subsurface structure of the field.
- No structural anomaly was found in the area of the East Reed City field. This field is producing from a minor stratigraphic trap and is unimportant from a producing standpoint.
- Favorable structure was shown in the area of the Cedar field and checks the subsurface structure of the field.
- Favorable structure was indicated in the area of the Evart field. This is in agreement with

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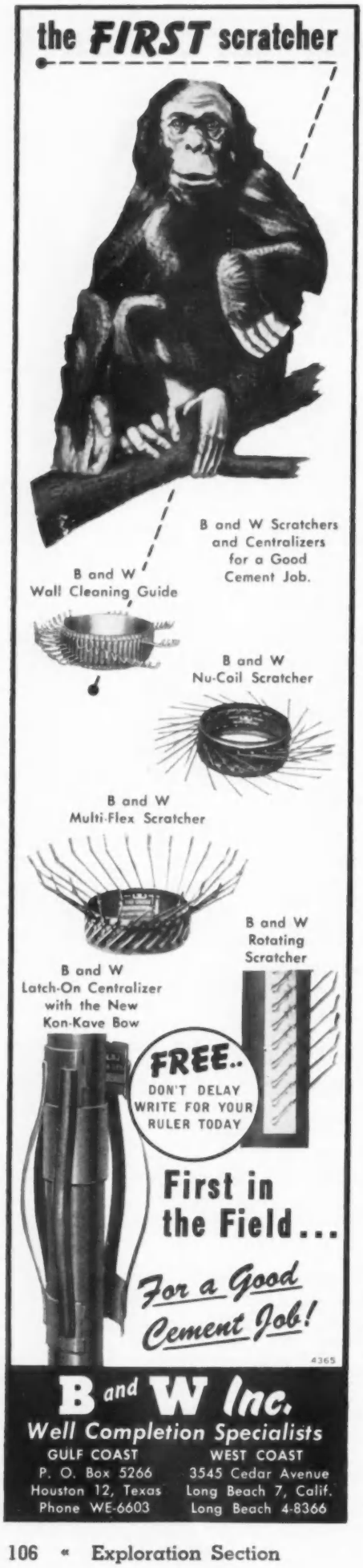
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## About the Author

BERNARD H. LASKY is a graduate of Stanford University with a B.S. degree in geology and mining. He served as a mining geologist in the western and southwestern states and has been a consulting geologist, specializing in exploration for oil and gas, in Tulsa and Houston for many years. Lasky began experimental work in surface mineralization in 1942 and has been engaged continuously in the progressive development of the alteration study technique since that time.

the subsurface structure of the field.

- Favorable structure was shown in the area of the Sylvan field. It conforms to the subsurface structure of the field.
- An anomalous structure condition was indicated in the area of the Freeman-Redding field which suggested that either favorable structure existed in this area and/or an important structure was present northeast of the terminal point of the profile. The influence of the Marion and Winterfield structures to the northeast had therefore been indicated.

This study is of particular interest in the light of the statistical history of oil and gas in Michigan. In 1952, 293 exploratory wells were drilled in the state. Of these, 33 were successful, which indicates a success factor of 11.2 percent. Nine new oil fields and two gas fields were discovered as a result of this drilling. Of the eleven discoveries, ten were credited to subsurface work and one to the gravity meter.[4]

The total oil production for Michigan has declined from approximately 18,500,000 barrels in 1944 to about 13,250,000 barrels in 1952. This decrease in production has occurred in the face of a marked increase in the number of core drill tests. In 1944, 181 geological core tests were drilled, and there was a sharp increase in the number of these tests to 1950 when 555 tests were drilled. In 1951, 556 tests were drilled, but in 1952 the number dropped to 223.[4] It is significant that no core tests were drilled in the first six months of 1953.

Figure 3 shows the total annual oil production and the number of exploratory wells drilled yearly from 1944 to 1952.

All producing provinces present exploration problems, and the methods used in the successful resolution of the problems of one area do not necessarily apply to another. Michigan presents no exception to this general rule, for the presence of a comparatively thick mantle of glacial drift has prevented the effective utilization of conventional exploration techniques in structural mapping in the Michigan Basin. While it is true that porosity is an important factor, the problems of Michigan are fundamentally those of finding subsurface structure—additional structures in the Traverse and Dundee Formations of the Devonian, which have yielded the greater portion of the oil of the state, and structures in the deeper beds of the Silurian and the Ordivician. Although some tests have been drilled to these deeper horizons, it cannot be considered that they have been adequately tested.

The problems of finding additional reserves in the state are undoubtedly not reducible to any single formula, and while the survey herein described is limited in scope, from the results of this project, the alteration study technique appears to offer considerable promise in the solution of structural problems in Michigan.

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## Exploratory Drilling . . . in October and First Ten Months, 1953-1952

| State or District | MONTH OF OCTOBER, 1953 | | | | | | | | | | | | | FIRST TEN MONTHS, 1953 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Productive Tests | | | | | | | | | Total Productive | Unproductive Tests | | | Total Exploratory Tests | Productive Tests | | | | | | | | Total Productive | | Unproductive Tests | | | Total Dry | | Total Exploratory Tests | |
| | New Fields | | | New Pays | | | Extensions | | | | | | | | New Fields | | | New Pays | | | Extensions | | | | | | | | | |
| | Oil | Dis. | Gas | Oil | Dis. | Gas | Oil | Dis. | Gas | | Wildcats | New Pays | Outposts | | Oil | Dis. | Gas | Oil | Dis. | Gas | Oil | Dis. | Gas | 10 Mo. 1953 | 10 Mo. 1952 | Wildcats | New Pays | Outposts | 10 Mo. 1953 | 10 Mo. 1952 | 10 Mo. 1953 | 10 Mo. 1952 |
| Alabama | | | | | | | | | | | 8 | | | 8 | | | | | | | | | | 2 | 68 | | | 68 | 31 | 68 | 33 |
| Arizona | | | | | | | | | | | | | | | | | | | | | | | | | 6 | | | 6 | 2 | 6 | 2 |
| Arkansas | 1 | | | 1 | | | 1 | | | 3 | 18 | | | 21 | 10 | | 1 | 12 | | | 4 | | 1 | 28 | 16 | 107 | | 1 | 108 | 92 | 136 | 108 |
| California | 2 | | 1 | 4 | | 1 | | | | 8 | 37 | | 1 | 46 | 14 | | 5 | 25 | | 6 | 15 | | 1 | 66 | 80 | 361 | 1 | 29 | 391 | 348 | 457 | 428 |
| Colorado | 1 | | | | | | | | | 1 | 21 | | | 22 | 22 | 2 | 10 | 1 | | 1 | 2 | | | 38 | 25 | 243 | | | 243 | 183 | 281 | 208 |
| Florida | | | | | | | | | | | 1 | | | 1 | | | | | | | | | | | | 29 | | | 29 | 7 | 29 | 7 |
| Georgia | | | | | | | | | | | 2 | | | 2 | | | | | | | | | | | | 7 | | | 7 | | 7 | |
| Idaho | | | | | | | | | | | | | | | | | | | | | | | | | | 4 | | | 4 | | 4 | |
| Illinois | 4 | | | | | | 2 | | | 6 | 58 | | | 64 | 21 | | 1 | 12 | | | 35 | | | 69 | 85 | 394 | | | 394 | 501 | 463 | 586 |
| Indiana | 1 | | | | | | 1 | | | 2 | 30 | | | 32 | 25 | | 2 | 2 | | 1 | 6 | | | 36 | 38 | 302 | | | 302 | 287 | 338 | 325 |
| Kansas | 11 | | | | | | | | 1 | 12 | 79 | | | 91 | 114 | | 17 | 3 | | | 4 | | 3 | 141 | 125 | 753 | | | 753 | 743 | 894 | 868 |
| Kentucky | | | | | | | | | | | 6 | | | 6 | 18 | | 1 | | | | 2 | | | 21 | 29 | 94 | | | 94 | 104 | 115 | 133 |
| Louisiana | 1 | | | 4 | 1 | | | | | 6 | 35 | | | 41 | 26 | 14 | 4 | 34 | 9 | 8 | 10 | 4 | 1 | 110 | 85 | 327 | | 6 | 333 | 315 | 443 | 400 |
| North Louisiana | | | | | | | | | | | 22 | | | 22 | 5 | 4 | | 5 | 1 | 1 | 7 | | | 23 | 36 | 169 | | 4 | 173 | 184 | 196 | 220 |
| South Louisiana | 1 | | | 4 | 1 | | | | | 6 | 13 | | | 19 | 21 | 10 | 4 | 29 | 8 | 7 | 3 | 4 | 1 | 87 | 49 | 158 | | 2 | 160 | 131 | 247 | 180 |
| Michigan | 2 | | | 1 | | | | | | 3 | 29 | | | 32 | 10 | | 4 | 1 | | | 4 | | | 19 | 31 | 213 | | | 213 | 202 | 232 | 233 |
| Mississippi | 2 | | | 3 | | | | | | 5 | 18 | | | 23 | 10 | 2 | 3 | 7 | 1 | | 2 | 1 | | 26 | 19 | 158 | | 6 | 164 | 136 | 190 | 155 |
| Missouri | | | | | | | | | | | | | | | | | | | | | | | | | | 10 | | | 10 | 16 | 10 | 16 |
| Montana | | | | | | | | | | | 14 | | | 14 | 10 | | 2 | | | | 1 | | | 13 | 9 | 95 | | | 95 | 68 | 108 | 77 |
| Nebraska | 2 | | | | | | 1 | | | 3 | 7 | | | 10 | 17 | | 3 | | | | 3 | | 1 | 24 | 14 | 119 | | 2 | 121 | 111 | 145 | 125 |
| Nevada | | | | | | | | | | | | | | | | | | | | | | | | | | 8 | | | 8 | | 8 | |
| New Mexico | 5 | | 5 | 1 | | 1 | | | 1 | 13 | 15 | | | 28 | 22 | | 31 | 2 | 1 | 1 | 5 | | 5 | 67 | 52 | 120 | | | 120 | 103 | 187 | 155 |
| North Carolina | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | 1 | | 1 | |
| North Dakota | | | | | | | | | | | 8 | | | 8 | 7 | | | 1 | | | 3 | | | 11 | 9 | 57 | | | 57 | 10 | 68 | 19 |
| Ohio | | | | | | | | | | | | | | | | | | | | | 2 | | 3 | 5 | 10 | 12 | | | 12 | 26 | 17 | 36 |
| Oklahoma | 11 | | 3 | 2 | | | 10 | | 2 | 28 | 60 | | | 88 | 102 | 6 | 23 | 27 | 1 | 3 | 61 | 1 | 7 | 231 | 165 | 596 | | | 596 | 613 | 827 | 778 |
| Pennsylvania | | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | | | | | | 2 | 1 | 2 |
| South Dakota | | | | | | | | | | | 2 | | | 2 | | | | | | | | | | | | 16 | | | 16 | 5 | 16 | 5 |
| Tennessee | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | 1 | | 1 | |
| Texas | 28 | 2 | 7 | 12 | 2 | 3 | 18 | 2 | 3 | 77 | 364 | | 3 | 444 | 414 | 55 | 74 | 188 | 40 | 21 | 120 | 19 | 21 | 952 | 829 | 3458 | | 82 | 3540 | 3438 | 4492 | 4267 |
| Dist. 1 S. Central | 1 | | 1 | | | | 1 | | | 3 | 33 | | | 36 | 14 | 2 | 4 | 1 | 2 | 1 | 2 | 1 | | 27 | 32 | 265 | | 7 | 272 | 290 | 299 | 322 |
| Dist. 2 Middle Gulf | 1 | | 4 | | | | | | 1 | 6 | 17 | | | 23 | 15 | 8 | 13 | 9 | 5 | 2 | 5 | 1 | 5 | 63 | 72 | 223 | | 5 | 228 | 244 | 291 | 316 |
| Dist. 3 Upper Gulf | 1 | 1 | | 1 | | 1 | 1 | 1 | 1 | 7 | 28 | | 1 | 36 | 23 | 13 | 5 | 36 | 15 | 8 | 10 | 11 | 8 | 129 | 123 | 297 | | 46 | 343 | 287 | 472 | 410 |
| Dist. 4 L. Gulf-SW | 1 | 1 | | 5 | 1 | | | 1 | | 9 | 50 | | | 59 | 36 | 21 | 23 | 49 | 15 | 7 | 2 | 4 | 4 | 161 | 95 | 409 | | 4 | 413 | 338 | 574 | 433 |
| Dist. 5 E. Central | | | | | | | | | | | 8 | | | 8 | 3 | 1 | 1 | 2 | 1 | | | | | 8 | 7 | 95 | | | 95 | 105 | 103 | 112 |
| Dist. 6 Northeast | 1 | | 1 | | | | | | | 2 | 11 | | | 13 | 9 | 3 | 1 | 5 | | | 1 | | | 19 | 17 | 123 | | 2 | 125 | 109 | 144 | 126 |
| Dist. 7-B N. Cent. | 10 | | | 1 | | 1 | 6 | | 1 | 19 | 86 | | 1 | 106 | 132 | | 16 | 28 | | 1 | 26 | 1 | 2 | 206 | 167 | 794 | | 3 | 797 | 775 | 1003 | 942 |
| Dist. 7-C W. Cent. | 3 | | | | 1 | | 1 | | | 5 | 36 | | | 41 | 46 | 6 | 5 | 14 | 1 | | 8 | | | 80 | 86 | 296 | | 2 | 298 | 314 | 378 | 400 |
| Dist. 8 West | 3 | | | 3 | | 1 | 4 | | | 11 | 33 | | | 44 | 59 | 1 | 2 | 17 | 1 | 1 | 28 | | | 109 | 100 | 312 | | 2 | 314 | 333 | 423 | 433 |
| Dist. 9 North | 6 | | 1 | 2 | | | 5 | | | 14 | 61 | | 1 | 76 | 75 | | 4 | 27 | | 1 | 37 | 1 | 2 | 147 | 129 | 637 | | 11 | 648 | 618 | 795 | 747 |
| Dist. 10 Panhandle | 1 | | | | | | | | | 1 | 1 | | | 2 | 2 | | | | | | 1 | | | 3 | 1 | 7 | | | 7 | 25 | 10 | 26 |
| Utah | 1 | | 2 | | | | | | | 3 | 4 | | | 7 | 4 | | 7 | | | | 1 | | | 12 | 1 | 37 | | | 37 | 44 | 49 | 45 |
| West Virginia | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | 3 | | 4 |
| Wyoming | 5 | | 1 | | | | | | | 6 | 11 | | | 17 | 23 | | 4 | 3 | | | 1 | | | 31 | 16 | 104 | | | 104 | 115 | 135 | 131 |
| Total U.S. | 77 | 2 | 19 | 28 | 3 | 5 | 33 | 2 | 7 | 176 | 827 | | 4 | 1007 | 869 | 79 | 192 | 318 | 52 | 41 | 281 | 25 | 44 | 1901 | 1641 | 7700 | 1 | 126 | 7827 | 7505 | 9728 | 9146 |

# Rates Remain High . . .

**More than 1000 wells completed for fifth month out of the last six.**

By **CECIL W. SMITH,** WORLD OIL Staff

EXPLORATORY DRILLING rates remained high during October and wells completed totaled over 1000 for the fifth month out of the last six. Only in September did completions dip slightly under that level. An interesting comparison with last year's record-breaking operations was pointed out by the fact that the only month in the entire year to hit the 1000 mark was also October.

The accumulated result of these record-breaking months is a grand total of 9728 completed exploratory tests, and that total represents a gain of 682 wells or 6.4 percent over last year's record activity. There can be little doubt that this year's exploration will reach a new all-time high.

A total of 1007 tests were officially completed during October and that was a gain of 29 wells over September's 978, which was the first to fall under the 1000-well level since the string was started in May. Resulting from the month's efforts were 176 wells that were rated as commercial producers of oil or gas. Those successes amounted to only 17.5 percent of the total drilled and did not measure up to the 198 that figured to be 20.2 percent of the total drilled a month earlier. Nor did they live up to the year's 10-month average of 19.5 percent.

**Summary of Results of Exploratory Drilling**

| ITEM | Oct., 1953 | Sept., 1953 | TEN MONTHS January-October 1953 | 1952 | Percent Diff. |
|---|---|---|---|---|---|
| **Oil Discoveries** | **105** | **132** | **1,187** | **1,064** | **+ 11.6** |
| New Fields | 77 | 107 | 869 | 820 | + 6.0 |
| New Pays | 28 | 25 | 318 | 244 | + 30.3 |
| **Distillate Discoveries** | **5** | **15** | **131** | **116** | **+ 12.9** |
| New Fields | 2 | 8 | 79 | 100 | — 21.0 |
| New Pays | 3 | 7 | 52 | 16 | +225.0 |
| **Gas Discoveries** | **24** | **29** | **233** | **168** | **+ 38.7** |
| New Fields | 19 | 26 | 192 | 135 | + 42.2 |
| New Pays | 5 | 3 | 41 | 33 | + 24.2 |
| **Total Discoveries** | **134** | **176** | **1,551** | **1,348** | **+ 15.1** |
| **Extensions to Fields** | **42** | **22** | **350** | **293** | **+ 19.5** |
| Oil Fields | 33 | 17 | 281 | 249 | + 12.9 |
| Distillate Fields | 2 | 1 | 25 | 8 | +212.5 |
| Gas Fields | 7 | 4 | 44 | 36 | + 22.2 |
| **Total Prod. Tests** | **176** | **198** | **1,901** | **1,641** | **+ 15.8** |
| **Dry Holes** | **831** | **780** | **7,827** | **7,505** | **+ 4.3** |
| Wildcats | 827 | 770 | 7,700 | 7,281 | + 5.8 |
| New Pays | | | 1 | 11 | — 90.9 |
| Outposts | 4 | 10 | 126 | 213 | — 40.9 |
| **Total Expl'tory Tests** | **1,007** | **978** | **9,728** | **9,146** | **+ 6.4** |
| Percent Productive | 17.5 | 20.2 | 19.5 | 17.9 | |
| Percent Dry | 82.5 | 79.8 | 80.5 | 82.1 | |

# U. S. Discoveries in October

## NEW FIELDS, NEW PAYS AND EXTENSIONS

### ARKANSAS—NEW OIL FIELD

**Miller County.** United Production Company Inc.'s Paulk & Dickert 1, C SE SW NE 15-17s-27w, pumped 102 barrels from Paluxy sand, Lower Cretaceous 4261-63 feet, 22-gravity, completed 10-2-53, TD 4520.

### ARKANSAS—NEW OIL PAY

**Columbia County, Spotsville field.** McAlester Fuel Co.'s I. H. Hollensworth Estate B-1, C SW 31-17s-18w, pumped 70 barrels oil and 4 barrels water from Pettit lime, Lower Cretaceous 4261-4270 feet, 33.1-gravity, completed 10-24-53, TD 7811.

### ARKANSAS—OIL FIELD EXTENSION

**Union County, Urbana field.** Burnett Production Co.'s Peck & Bukey A-1, C NE SE NE 22-18s-13w, 1-mile south extension, pumped 55 barrels from Travis Peak sand, Lower Cretaceous 3078-88 and 3104-09 feet, 36.5-gravity, completed 10-1-53, TD 3600.

### CALIFORNIA—NEW OIL FIELDS

**Fresno County.** Lloyd A. Harnish, Operator's 73-32F, SW NE 32-20s-16e, flowed 906 barrels from Leda sand, Miocene 8351-8410 feet, 24/64-inch, 36.5-gravity, completed 10-23-53, TD 8410.

**Los Angeles County, Bandini area.** General Exploration Co.'s C. C. M. O. 1, in 17-2s-12w, flowed 427 barrels from 6278-6318. feet, 38.7-gravity, completed 9-28-53, TD 6766.

### CALIFORNIA—NEW OIL PAYS

**Kern County, Rosedale Ranch field.** Standard Oil Co.'s KCL 31-38-1, SE SW 1-29s-26e, flowed 140 barrels oil and 17 barrels water from Chanac sand, Mississippian 4685-4715 feet, 18/64-inch, 20.5-gravity, completed 10-2-53, TD 4717.

**Orange County, Huntington Beach.** Wilson Oil Co.'s Peterson 1, in 11-6s-11w, Old Well Worked Over, pumped 86 barrels from 5296-5429 feet, 27-gravity, completed 9-26-53, TD 5487.

**Huntington Beach.** Wilson Oil Co.'s Talbert 1-3, in 14-6s-11w, pumped 200 barrels from Talbert sand, Miocene 3890-3940 feet, 16-gravity, completed 10-8-53, TD 5640.

**San Luis Obispo County, Midway Sunset field.** Oceanic Oil Co.'s C. C. M. O. A-2-1, NW SE 1-32s-22e, flowed 200 barrels from Republic sand, Pliocene 2772-87 feet, 13/64-inch, 20.9-gravity, completed 10-7-53, TD 2815.

### CALIFORNIA—NEW GAS FIELD

**Yolo County, Dunnigan Hills, Northeast field.** Signal Oil and Gas Company's Signal-Monterey-Reclamation 1, SE NW 20-12n-1e, flowed 4.1 million from Lower Eocene sand 3717-24 feet, 17/64-inch, completed 10-21-53, TD 5500.

### CALIFORNIA—NEW GAS PAY

**Sacramento County, Rio Vista field.** M. E. & Frank Silva Company's Silva 1, SW NW 24-4n-3e, flowed 4.0 million from Nortonville sand, Eocene 3779-3831 feet, 20/64-inch, completed 10-22-53, TD 4650.

### COLORADO—NEW OIL FIELD

**Washington County, Rago field.** Vaughey & Vaughey's Alexander 1, NW NW NE 12-1s-55w, pumped 106 barrels from "D" sand, Upper Cretaceous 4812-20 feet, completed 10-1-53, TD 4892.

### ILLINOIS—NEW OIL FIELDS

**Clay County, Louisville, North field.** A. A. Richey's H. Green 1, SW NW 11-4n-6e, Old Well Worked Over, pumped 105 barrels oil and 50 barrels water from Aux Vases sand, Mississippian 2759-64 feet, completed 10-21-53, TD 2977.

**Clinton County, Huey, South field.** Shulman Bros.' Farrell 3, NW NW SE 6-1n-2w, pumped 9 barrels oil and 40 barrels water from Cypress sand, Mississippian 1092-1098 feet, TD 1098.

**Marion County, Patoka, South field.** C. R. Winn's O. G. Singer 1, NW SE SW 4-3n-1e, pumped 50 barrels from Cypress sand, Mississippian 1349-55 feet, completed 10-6-53, TD 1355.

**Washington County, Posen, North field.** E. A. Obering's E. Liszewski 1, NW NE SW 9-3s-2w, pumped 4 barrels oil and 4 barrels water from Trenton lime, Ordovician 4016-31 feet, completed 10-27-53, TD 4112.

### ILLINOIS—OIL FIELD EXTENSIONS

**Hamilton County, Cantrell, South field.** W. I. McGlasson's R. Johnson 1, NE SE SW 8-7s-5e, ½-mile east extension, pumped 101 barrels oil and 8 barrels water from Aux Vases sand, Mississippian 3190-3208 feet, TD 3337.

**Saline County, Raleigh field.** Brewer-Robison-Travis' I. H. Massey 1, SE SE NW 35-7s-6e, Old Well Worked Over, 1-mile north extension, pumped 6 barrels oil and 10 barrels water from Cypress sand, Mississippian 2595-2605 feet, completed 10-6-53, TD 3128.

### INDIANA—NEW OIL FIELD

**Spencer County.** E. F. Moran-I. B. Buchman's Clyde Mackey 1, NE SW SE 31-7s-6w, pumped 13 barrels from Tar Springs sand, Mississippian, TD 1760.

### INDIANA—OIL FIELD EXTENSION

**Gibson County, Rochester field.** Olen D. Sharp's G. E. & A. C. McGaughey 1, SW NE NE 12-2s-13w, ½-mile north extension, from Waltersburg sand, Pennsylvanian, TD 2646.

### KANSAS—NEW OIL FIELDS

**Butler County, Mt. Tabor field.** Stelbar Oil Corp.'s Stolebarger 1, CN½ NE NE 36-29s-4e, pumped 25 barrels from Bartlesville sand, Pennsylvanian 2757-89 feet, TD 2784.

**Ellis County, Braun field.** Elreco & Rock Island Refining Co.'s Braun D-1, NE NW SW 34-13s-16w, pumped 240 barrels from Conglomerate 3459-66 feet, TD 3530.

**Dinkel field.** Alpine O&R Co.'s Dinkel 1, NE SW NE 23-13s-17w, pumped 18 barrels from Lansing lime, Pennsylvanian 3430-34 feet, TD 3561.

**Unnamed field.** Sunray Oil Corp.'s Schmeidler 1, NW NE NW 5-13s-17w, pumped 178 barrels from Arbuckle lime, Ordovician 3597-3601 feet, TD 3601.

**Kingman County, Orsemus field.** The Texas Co.'s Jake Graber 1, SE NE SW 30-29s-5w, pumped 1901 barrels from Simpson dolomite, Ordovician 4468-80 feet, TD 4614.

**Pawnee County, Oro, West field.** Carl Todd Drilling Co.'s Pfenninger 1, C NE SW 8-20s-19w, Old Well Worked Over, pumped 83 barrels from Conglomerate, Ordovician 4124-36 feet, TD 4417.

**Reno County, Bacon field.** Pam-Kar Drilling Co.'s Bacon 1, NE NW SW 36-23s-5w, pumped 178 barrels from Osage lime, Mississippian 3382-3410 feet, TD 3410.

**Rice County, Staatz field.** Beardmore Drilling's Staatz 1, SW SW NE 15-18s-9w, pumped 135 barrels from Conglomerate Ordovician 3249-57 feet, TD 3295.

**Stafford County, Green Ridge field.** Greenland Drilling et al's Cadman 1, NW NW NE 30-23s-14w, pumped 162 barrels from Lansing lime, Pennsylvanian 3788-96 feet, TD 4090.

**Sumner County, State Line field.** Smitherman & Grove's McCorgary 1, SE SW SE 14-35s-2e, pumped 100 barrels from Peru lime, Pennsylvanian 3158-75 feet, TD 3175.

**Trego County.** Carl Todd's Locker 1, NE NE NW 5-14s-21w, pumped 110 barrels from Conglomerate Ordovician 4026-47 feet, TD 4162.

### KANSAS—GAS FIELD EXTENSION

**Seward County.** M. B. Armer's Cook 1, C SW SW 12-35s-33w, flowed 5.0 million from Morrow sand, Mississippian 6064-6107 feet, TD 6183.

### SOUTH LOUISIANA—NEW OIL FIELD

**Pointe Coupee Parish.** The Texas Co.'s Bomer Blanks Lbr. Co. 1, in 29-5s-9e, flowed 160 barrels from Reno Sparta 10,398-406 feet, 46.5-gravity, completed 10-30-53, TD 10,600.

### SOUTH LOUISIANA—NEW OIL PAYS

**Beauregard Parish, Juanita field.** Houston Oil Co.'s Newport Ind. Inc. 2, in 13-5s-11w, flowed 184 barrels oil and 0.5 million from 7812-16 feet, 8/64-inch, 42.9-gravity, completed 10-12-53, TD 8006.

**Lafourche Parish, Bully Camp field.** Humble O&R Co.'s Delta Securities Co., Inc. 1, in 3-19s-20e, flowed 297 barrels from 11,845-853 feet, ⅛-inch, 38.4-gravity, completed 10-28-53, TD 12,283.

**Plaquemines Parish, West Delta Block 53 field.** Continental Oil Co.'s St. Lse 979-West Delta block 54-1, Old Well Drilled Deeper, flowed 492 barrels from 10,212-222 feet, 10/64-inch, 32.8-gravity, completed 10-31-53, TD 12,665.

**St. Mary Parish, Eugene Island-Block 126 field.** Magnolia Petroleum Co.'s State Lease 691-F-1, Block 119, flowed 558 barrels from 9476-86 feet, 12/64-inch, 36.1-gravity, completed 10-6-53, TD 10,196.

### SOUTH LOUISIANA—NEW DISTILLATE PAY

**St. Martin Parish, Atchafalava field.** R. R. Frankel's Iberville Land Co. 1, in 111-7s-8e, ungauged from 10,200-205 feet, completed 10-15-53, TD 10,956.

### MICHIGAN—NEW OIL FIELDS

**Arenac County.** Lakeland Oil Corp.'s Vaughan 1, C NW SW 11-19n-6e, Au Gres Township, pumped 7 barrels from Richfield lime 4152-63 feet, TD 4189.

**Huron County.** Alan S. Gray's Clancy 1, NE SW SW 12-18n-12e, Hume Township, pumped 8 barrels from Detroit River lime, Devonian 3111-18 feet, TD 3145.

### MICHIGAN—NEW OIL PAY

**Clare County, Cranberry Lake field.** Miami Operating Co. & Leonard Drilling Co.'s State-Winterfield B-1, NW SE SW 2-20n-6w, Winterfield Township, pumped 50 barrels from Detroit River lime, Devonian 4710-4820 feet, TD 5143.

### MISSISSIPPI—NEW OIL FIELDS

**Adams County, Forrest Home field.** John S. Callon's Mrs. Nan D. Foster 1, in 35-8n-1w, pumped 76 barrels oil and 19 barrels water from Wilcox (Foster) sand, Eocene 5701-05 feet, 40.5-gravity, completed 10-24-53, TD 6515.

**Monroe County, New Hope field.** Magnolia Petroleum Co.'s J. B. Snow A-1, C NW NE 27-13s-7e, pumped 203 barrels oil and 25 barrels water from Knox dolomite, Ordovician 4753-56 feet, 35-gravity, completed 10-18-53, TD 4769.

### MISSISSIPPI—NEW OIL PAYS

**Adams County, Forrest Home field.** Lindsey-Biglane-Callon's Geo. W. Armstrong 1, in 35-8n-1w, pumped 60 barrels oil and 30 barrels water from Wilcox sand, Eocene 4252-63 feet, 35-gravity, completed 10-24-53, TD 6506.

**North Overton field.** Estate of Wm. Helis, et al & Southern Prod. Co.'s Armstrong-Egypt 1, in 18-5n-2w, flowed 62 barrels from Wilcox (Foster) sand, Eocene 6274-77 feet, ¼-inch, 35-gravity, completed 10-17-53, TD 6589.

**Wayside field.** Magnolia Petroleum Co.'s Elizabeth Netterville 2, in 1-5n-2w, flowed 127 barrels oil and 12 barrels water from Wilcox sand, Eocene 4652-54 feet, 12/64-inch, 31.6-gravity, completed 10-12-53, TD 7005.

### NEBRASKA—NEW OIL FIELDS

**Cheyenne County.** Chicago Corp. & Republic Natural Gas Co.'s Runge 1, SW SE NE 17-14n-50w, pumped 65 barrels oil and 27 barrels water from "D" sand, Upper Cretaceous 4726-29 feet, completed 10-29-53, TD 4927.

**Kimball County, Chaney field.** Mid-Continent Petroleum Corp.'s Chaney 1, NE NE NE 27-13n-57w, pumped 75 barrels from "J" sand, Upper Cretaceous 6979-86 feet, completed 10-20-53, TD 7057.

### NEBRASKA—OIL FIELD EXTENSION

**Banner County, Harrisburg field.** Stanolind Oil & Gas Co.'s Downer 2, NE NE SW 5-18n-55w, pumped 46 barrels from "J" sand, Upper Cretaceous 5878-80 feet, completed 10-21-53, TD 5936.

### NEW MEXICO—NEW OIL FIELDS

**Eddy County.** Richardson & Bass' J. N. Fidel-Federal 1, in 27-21s-29e, flowed 175 barrels oil and 44 barrels water from Bone Springs lime, Permian 6890-6950 feet, ¼-inch, 37.5-gravity, completed 9-18-53, TD 15,611.

**Lea County.** Blackwood & Nichols Co.'s Carter 1, in 5-18s-39e, pumped 12 barrels oil and 100 barrels water from 5822-36 feet, 2-inch, 29-gravity, completed 8-31-53, TD 6628.

**Unnamed field.** The Texas Co.'s E. M. Byers 1, in 19-24s-38e, flowed 39 barrels from Tubb lime, Permian 6632-66 feet, 2-inch, 37.3-gravity, completed 10-23-53, TD 6686.

**Unnamed field.** Warren-Bradshaw Exploration Co.'s State 1, in 1-17s-34e, flowed 72 barrels from San Andres lime, Permian 4726-5002 feet, 2-inch, 37-gravity, completed 9-29-53, TD 5050.

**San Juan County.** L. G. Stearns' Navajo 1, NW SE SE 36-22n-4w, pumped 12 barrels oil and 10 barrels water from Mesaverde sand, Upper Cretaceous 885-889 feet, 33-gravity, completed 10-12-53, TD 889.

### NEW MEXICO—NEW OIL PAY

**Lea County.** W. H. Black's American Republics 1, in 14-20s-33e, pumped 170 barrels from Seven Rivers lime, Permian 3373-85 feet, 2-inch, 33.8-gravity, completed 9-28-53, TD 3385.

### NEW MEXICO—NEW GAS FIELDS

**Rio Arriba County.** El Paso Natural Gas Co.'s San Juan 28-6 Unit 4, SE NW SW 26-28n-6w, flowed 4.8 million from Mesaverde sand, Upper Cretaceous 5080-5722 feet, completed 10-14-53, TD 5722.

**Unnamed field.** Phillips Petroleum Co.'s San Juan 29-6 Unit 5-30, NW SE SW 30-29n-6w, flowed 6.6 million from Mesaverde sand, Upper Cretaceous 5220-5920 feet, completed 10-6-53, TD 5920.

**Unnamed field.** Phillips Petroleum Co.'s Unit (1-22) 30-5, SW NE NE 22-30n-5w, flowed 0.8 million from Mesaverde sand, Upper Cretaceous 5542-5875 feet, completed 3-20-53, TD 6238.

**San Juan County.** Lucille Pipkin's Pipkin 1, SW NE NW 1-25n-10w, flowed 0.3 million from Pictured Cliffs sand, Upper Cretaceous 2118-75 feet, completed 10-30-53, TD 4195.

**Unnamed field.** Wood River Oil & Refining Co.'s Carle 1, SW NE NW 20-30n-11w, flowed 0.5 million from Pictured Cliffs sand, Upper Cretaceous 2084-2120 feet, completed 8-24-53, TD 2120.

### NEW MEXICO—NEW GAS PAY

**San Juan County, Blanco field.** Phillips Petroleum Co.'s Mesa Unit (32-7) 4-22, NW SE SW 22-32n-7w, flowed 0.2 million from Fruitland sand, Upper Cretaceous 3238-3488 feet, completed 9-10-53, TD 3488.

### NEW MEXICO—GAS FIELD EXTENSION

**Rio Arriba County, Doswell field.** Johnston Oil & Gas Co.'s Rincon Unit 5, SE SE 32-27n-6w, 1-mile extension, flowed 0.5 million from Pictured Cliffs sand, Upper Cretaceous 2995-3194 feet, completed 10-16-53, TD 3194.

### OKLAHOMA—NEW OIL FIELDS

**Atoka County.** Hal H. Vaughn's School Land 1, C NE NW 26-1n-4e, Old Well Drilled Deeper, pumped 3 barrels from 480-484 feet, 42-gravity, TD 636.

**Carter County, Joiner City, West field.** Woodward & Co.'s Mary Barker 1, NW NW NW 33-4s-3w, flowed 33 barrels from Bois D'Arc lime, Devonian 6410-7154 feet and from Chimney Hill lime, Silurian, ⅜-inch, 38-gravity, TD 7172.

**Cleveland County, Clear Brook, Southwest field.** Continental Oil Co.'s F. Cook, Jr. 1, SW SE NE 15-8n-1w, flowed 120 barrels from 2nd Wilcox sand, Ordovician 7181-82 feet, 17/64-inch, 37.7-gravity, TD 8008.

**Garvin County, Maysville field.** Magnolia Petroleum Co.'s C. P. Allison 1, NW SW NW 22-4n-2w, flowed 320 barrels from Bromide sand, Ordovician 6524-64 feet, 12/64-inch, 42-gravity, TD 6637.

**Lincoln County, Mt. Vernon, West field.** Jernigan & Morgan's Starling 1, NE NE NE 8-15n-3e, flowed 25 barrels from Lower Skinner sand, Pennsylvanian 4333-38 feet, ⅛-inch, 39-gravity, TD 4373.

**Unnamed field.** Floyd G. Hubbell's School 1, SW SW SW 36-16n-5e, flowed 8 barrels from Misener sand, Mississippian 4076-80 feet and from Hunton lime, Devonian 4082-88 feet, 15/64-inch, 43-gravity, TD 4237.

**Unnamed field.** Jones-Shelburne, Inc.'s Evans 1, NE SE NE 26-14n-6e, flowed 2 barrels from Prue sand, Pennsylvanian 2923-33 feet, TD 2991.

**Noble County.** Avila Oil Co.'s Juanita White 1, C SE NW 32-22n-2e, flowed 36 barrels from Wilcox sand, Ordovician 4522-34 feet, 11/64-inch, 44.5-gravity, TD 4534.

**Okfuskee County, White Rose, Northwest field.** Plateau Development Co.'s Replogle 1, NW SW SW 10-13n-9e, pumped 7 barrels from Dutch sand, Pennsylvanian 3167-95 feet, 32-gravity, TD 3992.

**Osage County, Little Chief, Southeast field.** Kewanee Oil's Osage 1, NW NW NW 19-25n-7e, flowed 50 barrels from Burbank sand, Pennsylvanian 2811-21 feet, ½-inch, TD 2866.

**Texas County, Eva, Northeast field.** United Carbon Inc., Florence T. Kelley 1, SE NE 2-4n-10ecm, flowed 21 barrels from Morrow sand, Pennsylvanian 4411-40 feet, TD 5035.

### OKLAHOMA—NEW OIL PAYS

**Beckham County, Elk City field.** Shell Oil Co.'s Carter-Caughron 1, C SE NW 19-10n-21w, flowed 32 barrels oil and 2 barrels water from Des Moines lime, Pennsylvanian 12,704-734 feet, 22/64-inch, TD 15,624.

**Logan County, Lockridge, Northeast field.** Powel Briscoe's Carol Gungoll 1, NW NW NE 27-15n-4w, pumped 15 barrels

from Prue sand, Pennsylvanian 6200-28 feet, TD 6331.

### OKLAHOMA—OIL FIELD EXTENSIONS

**Garvin County, Panther Creek, Southwest field.** Continental Oil Co.'s Rose-Vose E-1, C SE NW 5-2n-3w, pumped 128 barrels from Springer sand, Pennsylvanian 9578-9674 feet, 37.6-gravity, TD 9755.

**Lincoln County, Skellyville field.** Ben J. Taylor's Guin 1, SW SW NE 9-15n-6e, Old Well Drilled Deeper, ¾-mile southeast extension, flowed 40 barrels from Hunton lime, Devonian 3964-72 feet, ¼-inch, 40-gravity, TD 4212.

**Stroud field.** Wilcox Oil Co.'s Ritts 1, NW SE SW 22-14n-6e, southeast extension, flowed 95 barrels from Prue sand, Pennsylvanian 3072-3145 feet, 19/32-inch, 46-gravity, TD 3145.

**Sunflower, Southeast field.** Jones-Shelburne, Inc.'s Powell 1, SW SW SW 22-14n-2e, northeast extension, pumped 5 barrels from 3753-62 feet, 50-gravity, TD 3805.

**Unnamed field.** Carter Oil Co.'s Toria D. Conley 1, SW NW SE 7-15n-4e, pumped 18 barrels oil and 5 barrels water from Red Fork sand, Pennsylvanian 4224-32 feet, TD 4300.

**Logan County, Lockridge, Northwest field.** Powel Briscoe's Chappell 1, NW NW SW 27-15n-4w, ½-mile south extension, flowed 102 barrels from Hogshooter lime, Pennsylvanian 5490-5528 feet, 9/64-inch, 43-gravity, TD 5540.

**Okfuskee County, Haydenville field.** Indian Head Oil Co.'s Badger 1, SE NE SW 24-13n-9e, flowed 20 barrels from Lower Dutcher sand, Pennsylvanian 3216-26 feet, 10/64-inch, 39-gravity, TD 3275.

**Osage County, Drum, North field.** A. G. Oliphant's Osage 1, NW NW NE 10-25n-4e, north extension, pumped 12 barrels oil and 145 barrels water from Mississippi Chat 3463-85 feet, TD 3485.

**Pawnee County, Maramec field.** Kidd Williams Drilling Corp.'s Ruth Cassaway 1, NE SW NE 27-20n-6e, ½-mile north extension, flowed 20 barrels from Skinner sand, Pennsylvanian 2854-62 feet, 46/64-inch, 34-gravity, TD 3370.

**Pottawatomie County, St. Louis field.** Royal Petroleum's W. C. White 1, SW NW SE 13-7n-3e, pumped 20 barrels from Earlsboro sand, Pennsylvanian 3924-28 feet, TD 4290.

### OKLAHOMA—NEW GAS FIELDS

**Okfuskee County.** Appleton Oil's Black 1-E, NW NE SW 29-12n-11e, flowed 3.5 million from Senora sand, Pennsylvanian 1300-50 feet, TD 3716.

**Pittsburg County.** J. E. Weible's R. R. Alley 1, SW SW NW 17-8n-15w, flowed 0.1 million from Fears Coal Pennsylvanian 1900-2030 feet, TD 2250.

**Pontotoc County.** Barr Construction Co.'s Rush 1, SW SW SE 5-4n-6e, flowed 1.5 million from Senora sand, Pennsylvanian 1194-1200 and from Thurman sand, Pennsylvanian 1280-85 feet, TD 1600.

### OKLAHOMA—GAS FIELD EXTENSIONS

**Grady County, Chickasha field.** Dick Wegener Drilling Co.'s Payton 1, SW NW NW 16-5n-8w, flowed 9.0 million from Deese sand, Pennsylvanian 5752-6168 feet, open, TD 7521.

**Lincoln County.** Hubbell & Deck's Spice 1, SE NW NE 2-15n-5e, flowed 3.0 million from Oswego sand, Pennsylvanian 3204-38 feet, TD 3238.

### TEXAS DISTRICT 1—NEW OIL FIELD

**Atascosa County.** Sutton Drilling Co.'s F. C. McKinney 1, H&GN RR Survey, pumped 96 barrels from 3687-3729 feet, 48-gravity, completed 10-28-53, TD 3729.

### TEXAS DISTRICT 1—OIL FIELD EXTENSION

**Atascosa County, Kyote field.** George Parker et al's Theo Rogers 1, J. Low Survey #1349, ½-mile southeast extension, pumped 32 barrels from Navarro sand, Upper Cretaceous 3615-23 feet, 40.1-gravity, completed 10-16-53, TD 3623.

### TEXAS DISTRICT 1—NEW GAS FIELD

**Frio County, Big Foot, West field.** George Parker's Della F. Howard et al 1, Henry Maney Survey 6, flowed 1.4 million from 3181-3209 feet, open, completed 10-15-53, TD 3209.

### TEXAS DISTRICT 2—NEW OIL FIELD

**Live Oak County, Marsden field.** Henderson Coquat et al's Mollie Marsden 1, Dennis McGowen Survey, flowed 20 barrels oil from 7542-47 feet, ¼-inch, 34-gravity, completed 9-10-53, TD 7878.

### TEXAS DISTRICT 2—NEW GAS FIELDS

**Bee County.** Producers Corp. of Nevada's Brown F. Beasley 1, William Allen Survey, ungauged from Upper Stillwell sand 4818-22 feet, completed 8-20-53, TD 4889.


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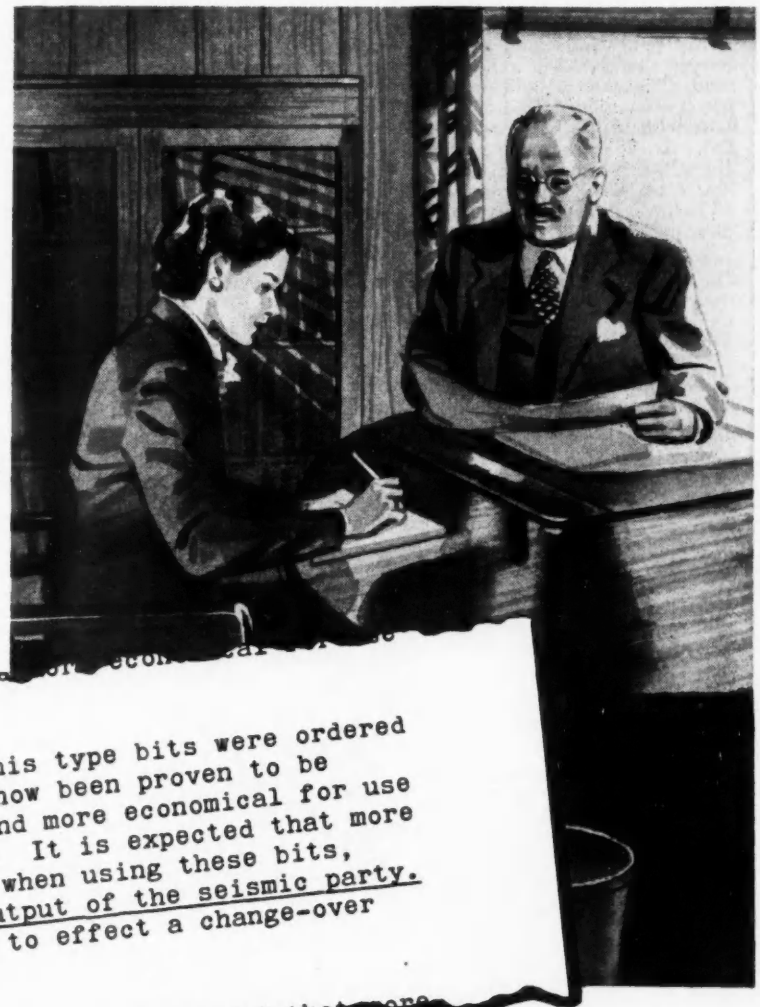

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**Jackson County, Carmichael field.** H. J. Porter et al's Carmichael 1, R. T. Crain Survey, flowed 2.6 million from Frio sand, Oligocene 4180-84 feet, open, 62-gravity, completed 10-1-53, TD 4500.

**Drushel field.** H. J. Porter et al's Drushel C-1, R. T. Crain Survey, Section 2, Hays Ranch Subdivision, flowed 4.7 million from Vicksburg sand, Oligocene 5535-57 feet, 62-gravity, open, completed 10-5-53, TD 5619.

**Lasso field.** Great Lakes Carbon Corp.'s Dorothy E. Cox 1, Carlos Lasso Survey, flowed 19.0 million from Frio sand, Oligocene 6246-54 feet, completed 8-21-53, TD 6444.

### TEXAS DISTRICT 2—GAS FIELD EXTENSION

**Jackson County, Francitas field.** Houston Oil Co. & Francitas Gas Co.'s T. F. Lovett Estate 3, Patrick Green Survey, southeast extension, ungauged from Vicksburg sand, Oligocene 8644-54 feet, completed 10-5-53, TD 11,377.

### TEXAS DISTRICT 3—NEW OIL FIELD

**Lee County.** Brazos O&G Co. & E. W. Brown's Herman E. Brade 1, Alfred White Survey, pumped 11 barrels from Wilcox sand, Eocene 2877-79 feet, 18.1-gravity, completed 10-4-53, TD 5979.

### TEXAS DISTRICT 3—NEW OIL PAY

**Houston County, Fort Trinidad field.** Woodley Petroleum Co. & The Moran Corp.'s W. T. Bruton 3, Barton Clark Survey, flowed 186 barrels from Dexter "A"-Woodbine sand, Upper Cretaceous 8654-88 feet, 12/64-inch, 37.6-gravity, completed 10-13-53, TD 9214.

### TEXAS DISTRICT 3—OIL FIELD EXTENSION

**Liberty County, South Liberty field.** The Texas Co.'s Wirt Davis Estate O/A-2, Liberty Town Tract South League, ½-mile northwest extension, flowed 116 barrels from Yegua sand, Eocene 9007-17 and 9025-39 feet, 12/64-inch, 36.7-gravity, completed 10-26-53, TD 10,950.

### TEXAS DISTRICT 3—NEW DISTILLATE FIELD

**Harris County.** Russell Maguire's F. Dooley Estate 1, Victor Blanco Survey, Dooley Subdivision, Lot 7, Old Well Drilled Deeper, flowed 77 barrels distillate and 3.0 million from Cook Mountain sand, Eocene 8929-32 feet, 14/64-inch, 52.8-gravity, completed 9-27-53, TD 9001.

### TEXAS DISTRICT 3—DISTILLATE FIELD EXTENSION

**Montgomery County, Bender field.** Sinclair Oil & Gas Co.'s Bender Estate B-1, Montgomery County School land, northeast extension, flowed 345 barrels distillate and 19.7 million from Cockfield sand, Eocene 5794-96 feet, open, 52-gravity, completed 10-6-53, TD 6199.

### TEXAS DISTRICT 3—NEW GAS PAY

**Colorado County, Garwood, West field.** Horace Coon, Jr.'s L. E. Brownson 1-B, A. Fisk Survey, ungauged, completed 9-15-53, TD 3700.

### TEXAS DISTRICT 3—GAS FIELD EXTENSION

**Wharton County, North Louise field.** Mid Coast Drilling Co.'s Jas. G. & Mildred McMurtry 1, WCRR Survey #44, flowed 69.8 million from 3057-60 feet, completed 8-2-53, TD 3065.

### TEXAS DISTRICT 4—NEW OIL FIELD

**Jim Hogg County, Norricitas Creek field.** H. L. Hunt's Silver Lake Ranches, Inc. 1-A, BS&F Survey #161, flowed 87 barrels from Upper Pettus sand, Eocene 4242-48 feet, 3/16-inch, 46-gravity, completed 10-9-53, TD 5454.

### TEXAS DISTRICT 4—NEW OIL PAYS

**Aransas County, Fulton Beach, West field.** Sun Oil Co.'s Copano State 75-2, Subdivision of Copano Bay, flowed 183 barrels from 8298-8312 feet, 11/64-inch, 42-gravity, completed 10-15-53, TD 8550.

**Duval County, Labbe, North field.** J. W. Gorman's Ferguson-State 2, BS&F Survey, Section 104, pumped 63 barrels from 2808-14 feet, 24-gravity, completed 9-21-53, TD 2897.

**San Patricio County, Spartan field.** Kirkwood & Co., Caroline Hunt Sands' Monroe Elliott 1, Welder & Odem Subdivision, Block 14, flowed 66 barrels from 6730-36 feet, 14/64-inch, 33.3-gravity, completed 10-21-53, TD 8015.

**Starr County, Sun, North field.** Bass & Vessels' Matias Pena 2, La Sal Colorado Grant, flowed 101 barrels from Frio sand, Oligocene 6243-49 feet, ⅛-inch, 47.6-gravity, completed 10-25-53, TD 6441.

**Webb County, De Spain field.** Dulaney Oil Co. et al's J. O. Walker 1, CCSD&RGNG Survey 264, pumped 42 barrels from Bruni sand, Eocene 2641-52 feet, 44.3-gravity, completed 9-27-53, TD 2652.

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### TEXAS DISTRICT 4—NEW DISTILLATE FIELD

**Kenedy County, Penascal, East field.** La-Gloria Corp. et al's Laguna Madre State Tract 225-1, flowed 12 barrels distillate and 5.3 million from Penascal "E" sand 7303-10 feet, 5/16-inch, 56.4-gravity, completed 10-24-53, TD 7558.

### TEXAS DISTRICT 4—NEW DISILLATE PAY

**Hidalgo County, San Ramon field.** Taylor O&G Co.'s Woods Christian et al 1, San Ramon Grant, Share 16-A, flowed 105 barrels distillate and 7.2 million from 8358-73 feet, 54.6-gravity, completed 10-4-53, TD 10,020.

### TEXAS DISTRICT 4—DISTILLATE FIELD EXTENSION

**Hidalgo County, San Salvador field.** Western Natural Gas Company's E. Roberts 1, San Salvador Del Tule Grant, Share 159, ¾-mile southwest extension, ungauged, completed 10-17-53, TD 8813.

### TEXAS DISTRICT 6—NEW OIL FIELD

**Camp County, Newsome field.** W. D. McBee & H. S. Moss and B. G. Byars' H. G. Hatley 1, Samuel Sexton Survey, flowed 261 barrels from Pittsburg sand, Lower Cretaceous 8183-8201 feet, ¼-inch, 43.2-gravity, completed 10-14-53, TD 8242.

### TEXAS DISTRICT 6—NEW GAS FIELD

**Harrison County.** J. F. Wright et al's Bartlett & Bailey 1, Crawford Yarbrough Survey, Old Well Worked Over, flowed 3.6 million from Lower Pettit lime, Lower Cretaceous 6645-56 feet, open, completed 10-17-53, TD 7005.

### TEXAS DISTRICT 7-C—NEW OIL FIELDS

**Coke County.** W. M. & A. P. Fuller's Lou E. Johnson Estate 1, Section 67, Block 2, H&TC Survey, flowed 247 barrels from Strawn sand, Pennsylvanian 6652-6772 feet, 14/64-inch, 42.5-gravity, completed 10-22-53, TD 6825.

**Irion County.** Amerada Petroleum Corp.'s L. P. Van Keuren 1, Section 24, Block 1, H&TC Survey, pumped 19 barrels from Clearfork lime, Permian 3340-57 feet, 35.1-gravity, completed 9-30-53, TD 8171.

**Tom Green County.** C. L. McMahon, Inc. et al's J. W. Johnson Estate 1, Section 5, Block 25, H&TC Survey, flowed 113 barrels from Canyon lime, Pennsylvanian 4506-21 feet, 12/64-inch, 42.8-gravity, completed 10-27-53, TD 5636.

### TEXAS DISTRICT 7-C—OIL FIELD EXTENSION

**Reagan County, Spraberry Trend area.** Sohio Petroleum Co.'s W. B. Atkinson A-1, Section 27, Block 36, T-5-S, T&P Survey, flowed 821 barrels from Spraberry lime, Permian 6630-94 feet, 40/64-inch, 39.4-gravity, completed 10-8-53, TD 7592.

### TEXAS DISTRICT 7-C—NEW DISTILLATE PAY

**Crockett County, Noelke field.** Brown & Thorp Drilling Co. & W. C. Warren's Shannon Estate 1, J. Wiley Heirs Survey, Block 2, flowed 20 barrels distillate and 16.0 million from Whitehorse sand, Permian 2100-2200 feet, open, 57.2-gravity, completed 9-8-53, TD 2200.


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### TEXAS DISTRICT 8—NEW OIL FIELDS

**Midland County, Midland Farms, Southeast field.** Stanolind Oil & Gas Co.'s Midland Farms "AF" R/A "B"-1, Section 1, Block 40, T-1-S, T&P Survey, pumped 65 barrels from Grayburg lime, Permian 4600-40 feet, 2-inch, 30-gravity, completed 10-8-53, TD 4800.

**Mitchell County, Albaugh field.** Ray A. Albaugh's Whittington 1, Section 11, Block 17, SPRR Survey, Old Well Worked over, pumped 119 barrels from Pennsylvanian 6520-35 and 6540-50 feet, 2-inch, 40-gravity, completed 9-24-53, TD 8542.

**Reeves County, Cable field.** Magnolia Petroleum Co.'s Marvin Rape 1, Section 24, Block C-1, PSL Survey, pumped 139 barrels oil and 25 barrels water from Wolfcamp lime, Permian 10,080-318 feet, 42-gravity, completed 9-30-53, TD 11,258.

### TEXAS DISTRICT 8—NEW OIL PAYS

**Andrews County, Emma field.** Anderson-Prichard Oil Corp.'s W. F. Cowden 8, Section 102, W. F. Cowden Strip SF-9956, flowed 569 barrels from Ellenburger lime, Ordovician 12-307-343 feet, 12/64-inch, 49-gravity, completed 10-8-53, TD 12,343.

**Prichard field.** Anderson-Prichard Oil Corp.'s University "I"-1, Section 7, Block 7, University Lands Survey, flowed 703 barrels from Ellenburger lime, Ordovician 13-475-487 feet, ¼-inch, 47.2-gravity, completed 10-30-53, TD 13,487.

**Scurry County, Hermleigh field.** American Trading & Producing Corp.'s Elmer Howell A-1, Section 62, Block 3, H&TC Survey, Old Well Worker Over, flowed 364 barrels from Pennsylvanian sand 6530-42 feet, 20/64-inch, 39-gravity, completed 10-22-53, TD 7550.

### TEXAS DISTRICT 8—OIL FIELD EXTENSIONS

**Andrews County, Block 12 field.** The Texas Co.'s Texas-Atlantic-Superior State 1, Section 22, Block 12, University Lands Survey, 2½-mile southeast extension, flowed 630 barrels from Ellenburger lime, Ordovician 10,117-147 feet, ½-inch, 42.4-gravity, completed 10-6-52, TD 10,272.

**Gaines County, Nolley field.** Phillips Petroleum Co.'s Hunt-Jackson 1, Lab. 8, League 313, Gaines CSL Survey, 1-mile northeast extension, pumped 88 barrels from Wolfcamp lime, Permian 9462-9500 feet, 34-gravity, completed 10-30-53, TD 9753.

**Lynn County, P H D field.** Suniland Oil Corp.'s Cyrus Monroe "B" 1, Section 1274, J. R. Bowles Survey, 4-mile northwest extension, pumped 6 barrels oil and 48 barrels water from San Andres lime, Permian 3763-70 feet, 2-inch, 38-gravity, completed 9-28-53, TD 3786.

**Ward County, Quito field.** Argo Oil Corp."s Cyrus Monroe "B" 1, Section 195, Block 34, H&TC Survey, ¾-mile west extension, flowed 477 barrels from Delaware sand, Permian 4929-5097 feet, 20/64-inch, 38.6-gravity, completed 9-28-53, TD 5131.

### TEXAS DISTRICT 8—NEW GAS PAY

**Andrews County, Smith field.** Garrett M. Smith's McWhorter 1-X, Section 8, Block A-29, PSL Survey, gauged 1.0 million from San Andres lime, Permian 4297-4322 feet, open, completed 10-22-53, TD 4322.

### TEXAS DISTRICT 10—NEW OIL FIELD

**Hansford County.** Phillips Petroleum Co.'s Gochnaur 1, Section 34, Block 3, GH&H Survey, pumped 3 barrels oil and 9 barrels water from 5266-88 and 5304-14 feet, 33-gravity, completed 8-19-53, TD 5430.

### UTAH—NEW OIL FIELD

**Uintah County.** Carter Oil Co.'s Bamberger Unit 1, C SW NE 11-7s-23e, swabbed 109 barrels from Green River lime, Eocene 4735-43 feet, completed 10-22-53, TD 5754.

### UTAH—NEW GAS FIELDS

**Carbon County, Clear Creek Structure field.** Three States Natural Gas Co.'s Utah Fuel Unit 7, SE SW 17-13s-7e, flowed 36.0 million from Ferron sand, Upper Cretaceous 3838-4250 feet, completed 8-15-53, TD 4250.

**Emery County, Clear Creek area.** Three States Natural Gas Co.'s Paul T. Walton 1, SE SW 19-14s-7e, flowed 136.0 million from Ferron sand, Upper Cretaceous 4368-4439 feet, completed 10-20-53, TD 4439.

### WYOMING—NEW OIL FIELDS

**Natrona County, Salt Creek area.** March & Pursel's Gossett-Gov't 1, NE SW NE 30-40n-79w, pumped 20 barrels from 2nd Frontier sand, Upper Cretaceous 2805-15 and 2824-45 feet, completed 10-1-53, TD 2872.

**Washakie County, Nieber Dome area.** The California Co.'s Nieber Unit 5, SW SE SW 27-45n-92w, flowed 515 barrels from Phosphoria dolomite, Permian 10,088-118 feet, 9/16-inch, completed 10-24-53, TD 10,118.

**Weston County, Clareton area.** I. Pasternak's Keith Johnson-Gov't 1, NE SW NE 32-42n-66w, flowed 325 barrels from Newcastle lime, Upper Cretaceous 7442-62 feet, completed 10-10-53, TD 7534.

**Unnamed field.** True & Brown's Western Empire-Gov't 1-B, NE SE SE 27-42n-66w, flowed 143 barrels in 3 hours from Newcastle lime, Upper Cretaceous 7030-45 feet, completed 8-20-53, TD 7125.

**Unnamed field.** W. E. Hammond's Gaskill 2, NE NE SW 14-41n-66w, flowed 960 barrels from Newcastle lime, Upper Cretaceous 7075-90 feet, completed 10-1-53, TD 7200.

### WYOMING—NEW GAS FIELD

**Park County.** Heart Mountain Oil Co.'s Government 1, SE NW SE 6-54n-102w, flowed 8.0 million from 3rd Frontier sand, Upper Cretaceous 2950-3016 feet, completed 10-24-53, TD 3074.

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# Casing Can Be Cemented In Permafrost Area

**How the use of gypsum cements and portland slurries containing calcium chloride, plus some unusual procedures solved a drilling problem in U. S. Naval Reserve 4.**

**By LT. COL. FOSTER L. WHITE, USAF**

Munitions Board Joint Petroleum Committee, Washington, D. C.

CEMENTING CASING in surface formations that are frozen the year round imposed a serious problem in completing wells. Use of gypsum cements and portland slurrys containing calcium chloride plus some unusual cementing procedures solved the problem in drilling wells in the U. S. Naval Reserve 4 located well within the Arctic Circle of northern Alaska.

In this area, subsurface formation temperatures below the freezing point of water may be found down to 1000 feet below the surface. This permanently frozen section is appropriately named "permafrost." Figure 1 illustrates a typical temperature gradient for subsurface formations of the Reserve.

At the beginning of exploration work on NPR 4 the problem of cementing casing in this section was recognized as one not normally encountered in exploration work. Primary cause for concern was that cement slurries placed in formations with a temperature below the freezing point of water would be frozen prior to the time a set condition was reached. Preliminary work indicated that through the use of adulterants (principally calcium chloride) setting times could be accelerated so that a set could be reached before the slurry became frozen. However, actual experience with these slurries did not prove satisfactory.

During the spring of 1950 a considerable amount of research work was performed at Point Barrow, Alaska, to determine what cements and cementing procedures would satisfactorily perform under Arctic conditions.[1] As a result of these tests it was recommended that for temporary casing cementing jobs in formations where the temperature was freezing gypsum cements with very rapid setting times be used. For permanent cementing jobs in these formations it was recommended that standard portland cements mixed with sodium chloride dissolved in the mixing water be used and the waiting on cement time extended to give the slurry a chance to set. For cement slurries placed in unfrozen but still cold formations it was recommended that standard portland cement mixed with water containing calcium chloride in solution be used. Figure 2 shows the setting times vs. temperature for a 60-minute gypsum cement slurry determined from the 1950 tests. Figure 3 shows similar data for setting times of a slurry of standard portland cement mixed with water containing sodium chloride in solution. Figure 4

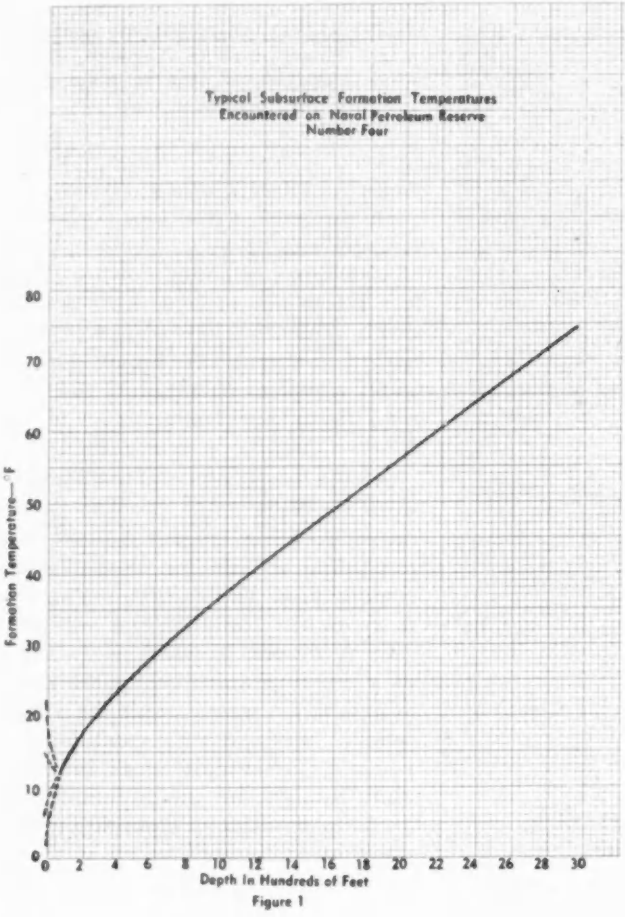

Figure 1

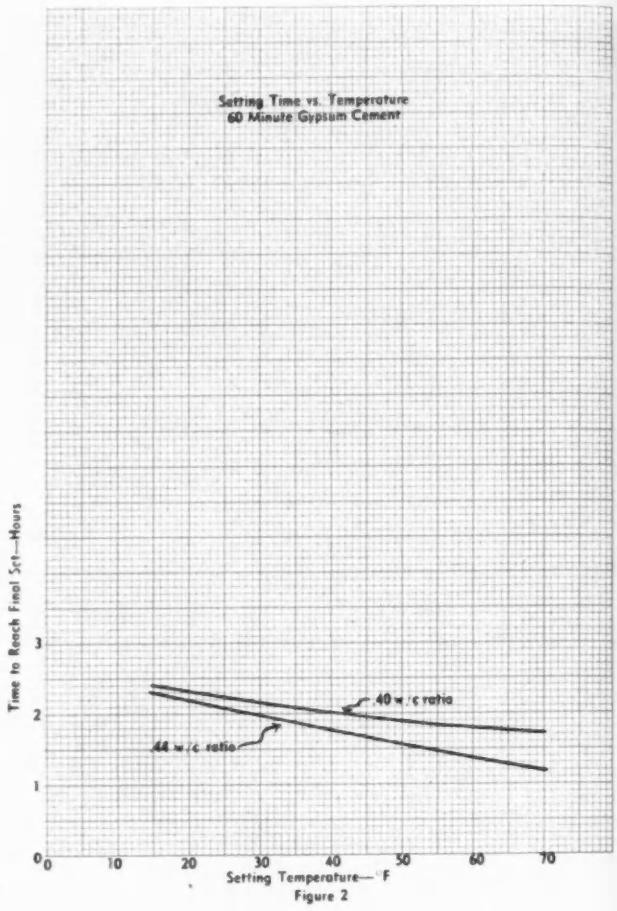

Figure 2

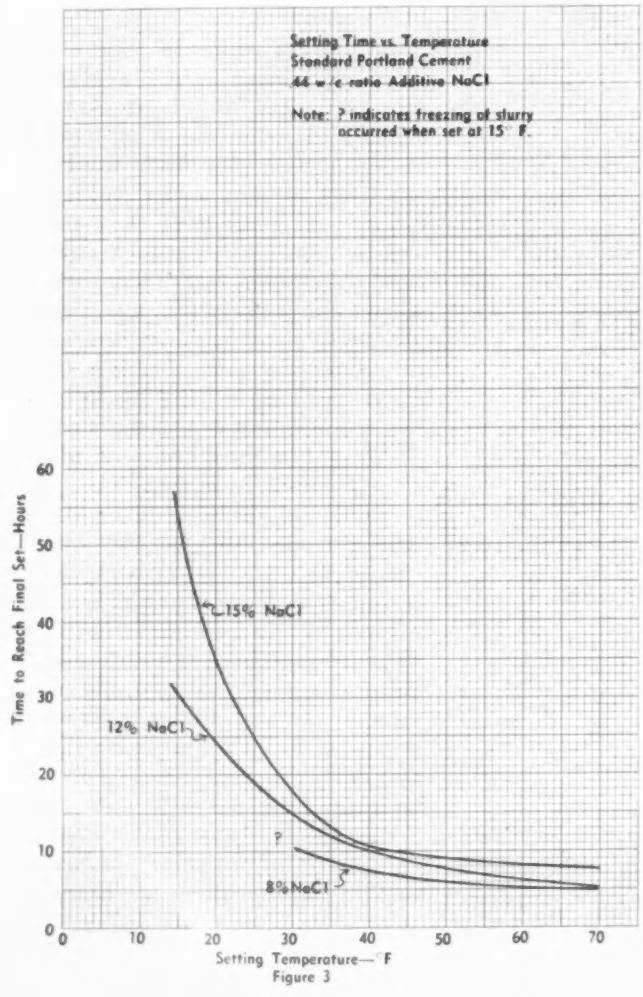

Figure 3

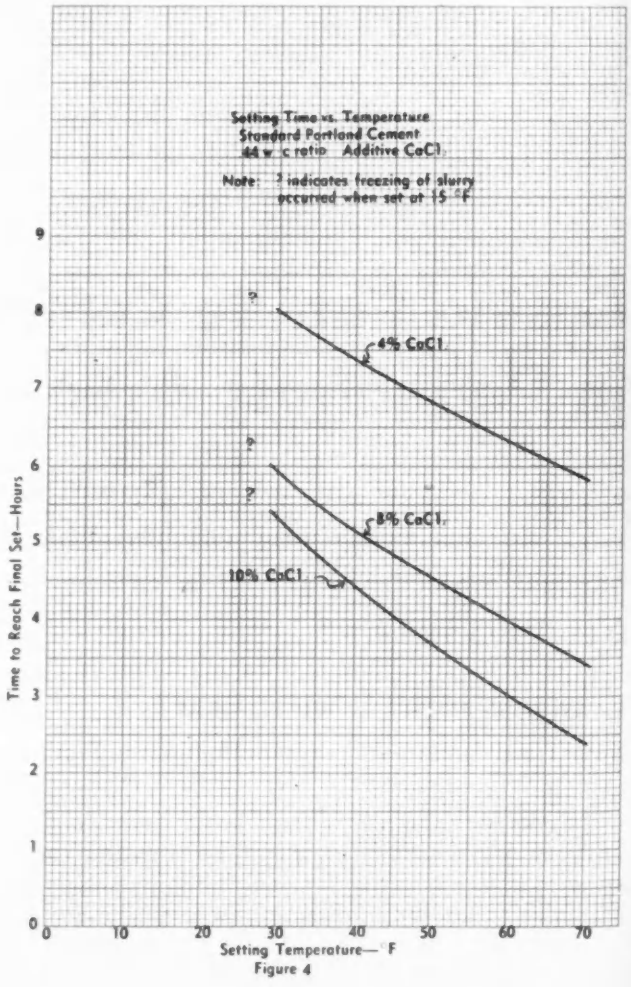

Figure 4

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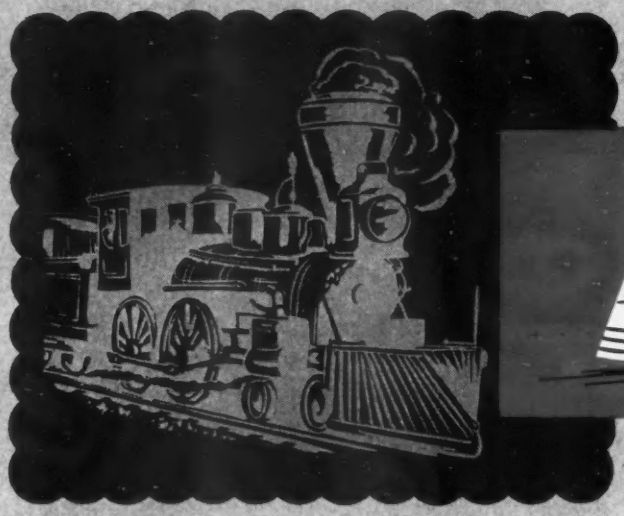

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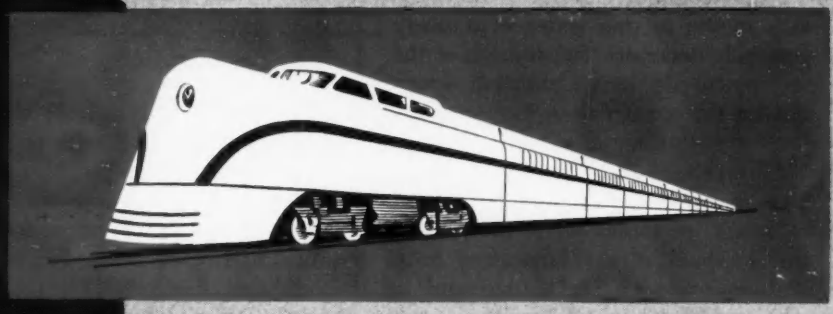

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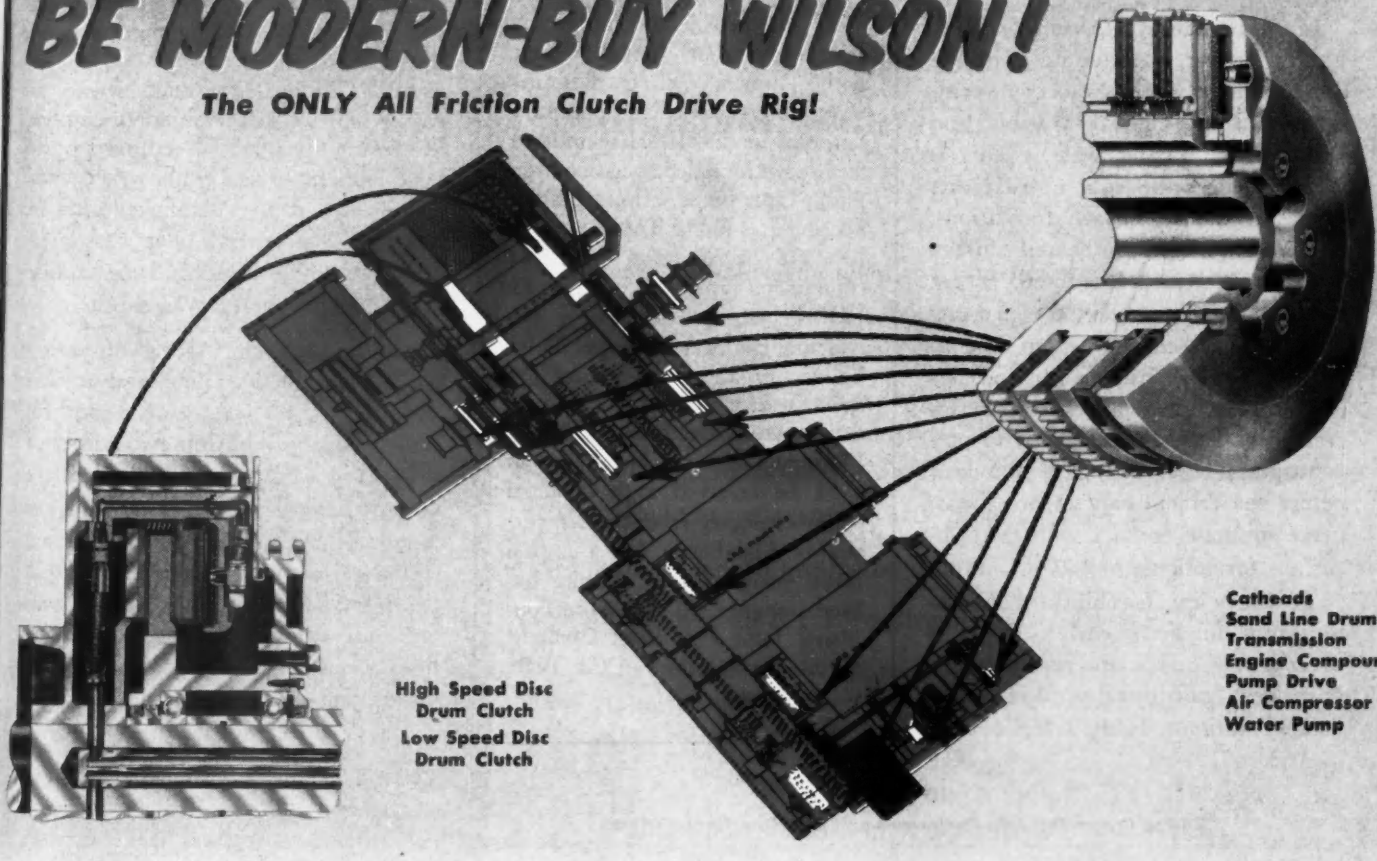

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shows the setting times determined for slurries of standard portland cement mixed with water containing calcium chloride in solution. The question marks shown on Figures 3 and 4 indicate that these slurries were frozen prior to reaching a final set when placed at 15° F. Using sodium chloride and calcium chloride as adulterants in the mixing water of a slurry generally decreases the strength of the set cement. However, strength developed is still greater than that required for cementing casing.

Cement slurries presented above have been used a sufficient number of times in actual wells to indicate the accuracy of the laboratory tests. Although not entirely successful in eliminating troubles associated with cementing of casing in or through the permafrost section some advantages have been found.

In the cementing of casing on NPR 4 every effort is made to mix the cement slurry when the cement temperature is as high as possible and with heated mixing water. This is done to offset the cold conditions found in the subsurface formations. Cements are kept in heated storage for several days before used. Steam coils mounted in tanks of cementing units furnish heat for water used in mixing a slurry. Prior to running casing, drilling fluid temperatures are increased and the hole warmed to prevent possible refreezing of the hole before the cement can set or at least make intimate contact with the subsurface formations.

To prove the feasibility of laboratory tests made in early 1950 it is necessary to review the results which have been achieved under actual field conditions. Table 1 lists several of the wells where these slurries were used for cementing casing strings. Each case is briefly discussed below.

## About the Author

LT. COL. FOSTER L. WHITE has been associated with the oil business most of his life. His childhood and early youth were spent in the oil boom areas of Burkburnett, Texas, Seminole, Ada and Earlsboro, Okla., and East Texas. He started working in the oil fields at the age of 16. He was graduated from the University of Oklahoma in 1940 with a B.S. in petroleum engineering and after a short period of time with Humble Oil & Refining Company, joined the military services in 1941. His military service has included assignments in Flight Operations, Aircraft Engineering and Flight Test Research. In 1946 he accepted a regular commission in the USAF. In 1949 he received an M.S. in petroleum engineering from Tulsa University and after graduation spent approximately one year as a petroleum engineer in Naval Petroleum Reserve No. Four. In 1952 he received a professional engineer degree from the University of Oklahoma. For the past three years Lt. Col. White has been assigned to the Munitions Board Joint Petroleum Committee as assistant chief of the Technical Division.

**Case 1.** The first string of casing run in this well was set at 90 feet. The two top joints were jacketed with larger diameter pipe enclosing a dead air space between the two for use as insulation. This insulation retarded the rate of heat exchange between relatively warm drilling fluids and frozen formations of the permafrost section. Gypsum cement slurry was used and the annular space between the wall of the hole and casing was completely filled. A large quantity of fresh water was pumped before and after the cement slurry to prevent contamination. The cement plug was drilled out in 30 hours from the time of mixing, and drilling continued until a depth of 2320 feet was reached. No trouble was encountered with leakage of drilling fluid around the casing string.

At 2320 feet, a second string of casing was set. Slurry used to cement this string consisted of standard portland cement mixed with water containing 4 percent calcium chloride in solution. The cement plug was cored at the end of 72 hours and the sample of cement recovered was excellent.

**Case 2.** Only one string of casing was placed in this hole and it was cemented at 92 feet using a gypsum cement slurry. The top two joints of this string were also jacketed with a larger diameter pipe. After the cement had set, drilling was continued for a period of 25 days reaching a depth of 3774 feet. No trouble was encountered with leakage of drilling fluid around this string although the outlet temperature of the drilling fluid reached 74° F.

**Case 3.** The first casing string placed in this hole was placed at 92 feet and only the top joint was jacketed with larger diameter pipe. This string was cemented with a gypsum cement slurry. Seven days after setting this string, circulation broke through the top formations around the outside of the casing. A slurry consisting of gypsum and portland cements was pumped into the annular space between the wall of the hole and the casing string to seal off the unde-

*Continued on Page 132*

**TABLE 1**

**Casing Cementing Jobs Performed on Cases One Through Five**

| Case Number | FIRST STRING | | SECOND STRING | | THIRD STRING | | Remarks |
|---|---|---|---|---|---|---|---|
| | Depth | Cement Used | Depth | Cement Used | Depth | Cement Used | |
| 1 | 90′ | Gypsum | 2320′ | Standard Portland with 4% $CaCl_2$ | | | |
| 2 | 92′ | Gypsum | | | | | |
| 3 | 92′ | Gypsum | 1101′ | Standard Portland with 8% NaCl and Oil Well Regular Type "C" with 8% $CaCl_2$ | | | First string gave trouble from leakage around outside of casing. |
| 4 | 107′ | Gypsum | 1101′ | Standard Portland with 10% NaCl and Oil Well Type "D" with 4% $CaCl_2$ | 6050′ | Oil Well Regular Type "C" | |
| 5 | 350′ | Gypsum | | | | | |

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# Power Transmission on Modern Rotary Rigs

**Here are the available drives—friction, fluid and electromagnetic—and what they will do.**

**By M. L. RIZZONE,**
Oil Well Supply Division, U. S. Steel Corporation, Dallas

**The Fluid Coupling.** The use of a fluid drive medium very sharply reduces the magnitude of the shock loads. Two types of hydrokinetic drives are used in the oil field, these being the hydraulic coupling and the hydraulic torque converter. Figure 8 shows the relationship between the torque magnitude, which is also the stress magnitude, upon the engagement of a friction drive as compared to a hydraulic drive. The hydraulic drive dissipates the shock loads over a much longer period of time and with only about three times the normal operating stresses. This very materially increases the wear life of the component parts of the power train.

Figure 9 shows a cross-section assembly of a fluid coupling. It consists of a rotating housing which is called the impeller and is connected to the power source, and the driven element called the "runner" connected to the driven equipment. The housing is filled with a fluid usually of the order of light burbine oil and, upon rotation of the impeller, fluid is slung outwardly by centrifugal force causing the fluid to gain in velocity. The runner receives the fluid causing it to lose its velocity and returns it to the center of the coupling to be thrown outwardly again by the impeller.

The circulating path of the fluid in this coupling is in the general shape of a torus with each particle of fluid following a path similar to a coil spring closed end for end into a doughnut shape. This coupling utilizes two paths of fluid flowing oppositely from each other, resulting in a balanced thrust load upon the runner and its bearing. Either element can act as an impeller; however, the housing is usually used for this purpose because when the output shaft is stalled the housing has a greater heat dissipating ability and is usually finned to aid in heat removal.

The fluid as mentioned above receives energy from the driving source by the impeller accelerating fluid to an increased velocity. This energy is transmitted to the runner which causes the fluid to decelerate and reduce its velocity. In this manner, torque transmission is accomplished. The output torque is always equal to the input speed minus the slip. The slip is the difference between the input and output speed. If this slip were zero, no torque would be transmitted. In order to function, these couplings require slip to operate and they are designed to operate normally at 3 percent to 4 percent slip.

The power loss is therefore the same as the slip—in other words normally these drives can be considered 97 percent efficient. The lost power is absorbed as heat and must be rejected by the coupling. These couplings will reject this small percentage of the power, but where sustained operation at greater slip values is required, external sources of fluid cooling would be necessary. Couplings are also available that have a variable fill arrangement which permits any amount of fluid to be removed from the coupling circuit and the slip varied in this manner. This fluid is passed over a cooler which extracts its heat. This type of coupling can operate satisfactorily under high slip conditions and has been used extensively in the oil fields.

**Part 2**

The fluid coupling generally is placed between the engine and compound shafting. The drive arrangement beyond the coupling is the same as for the mechanical rig and the equipment is operated in much the same manner. The salient advantages to be gained by the use of fluid couplings are:

- Shock loads are very materially reduced and increased wear life of parts in the power train may be expected.
- The fluid coupling smooths out torsional vibrations from the engine crankshaft.
- The fluid coupling acts as a check to minimize the effect of shocks from the power train to the engine and also the torsional vibrations from the engines to the driven equipment.
- The engine cannot be stalled.
- Output torque is always equal to the input torque.
- Synchronization of engines within allowable slip range.

**The Torque Converter.** Another form of hydrokinetic drive, which has found wide application on drilling equipment, is the torque converter. The primary difference between the torque converter and the fluid coupling is that the input torque in a torque converter may be multiplied within certain limits, whereas with the fluid coupling no torque multiplication is possible. By providing reaction blades which are fixed to the non-rotating housing of the torque converter, the fluid may be made to

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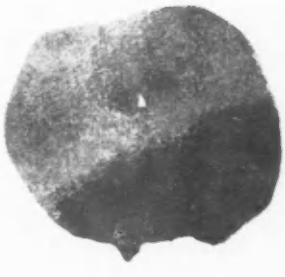

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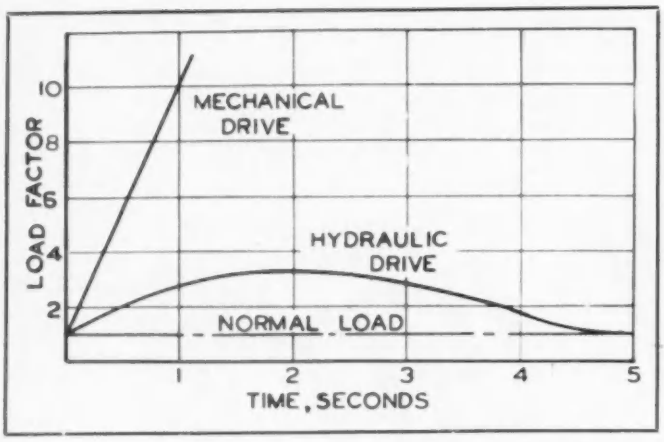



FIGURE 8

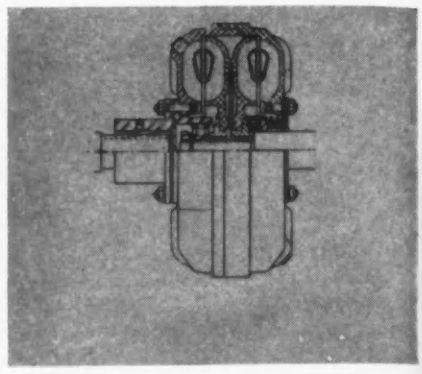


FIGURE 9

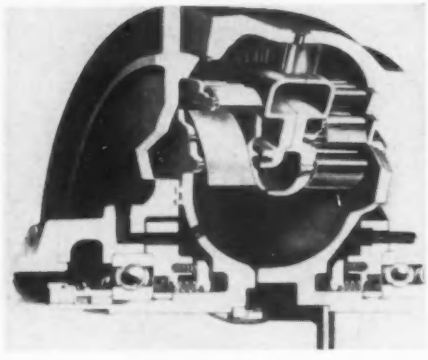
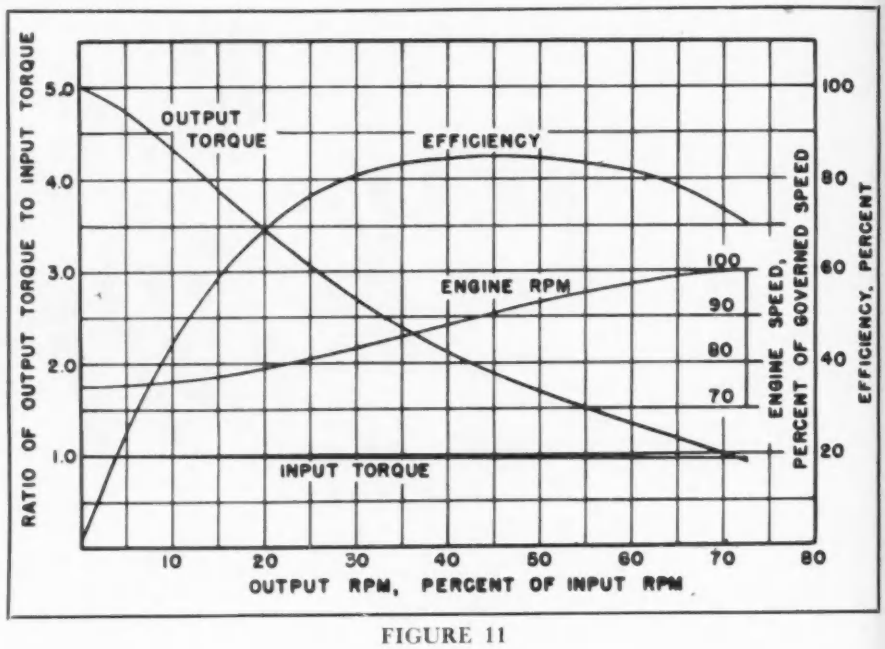


FIGURE 10

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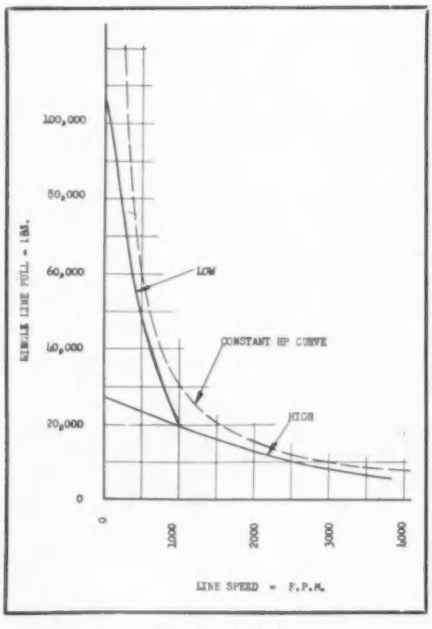



FIGURE 12

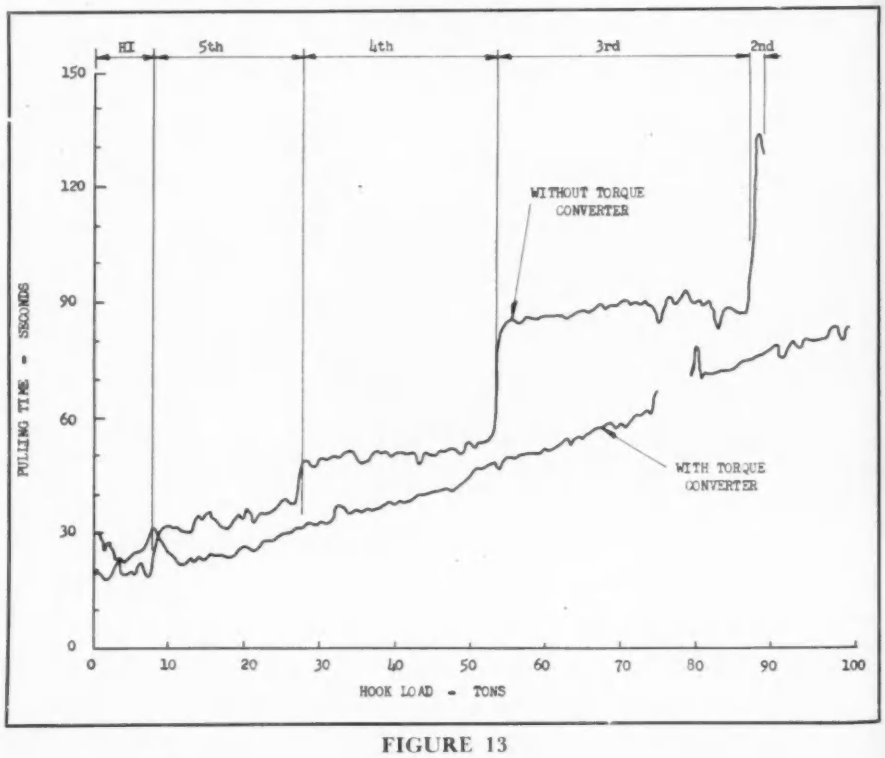
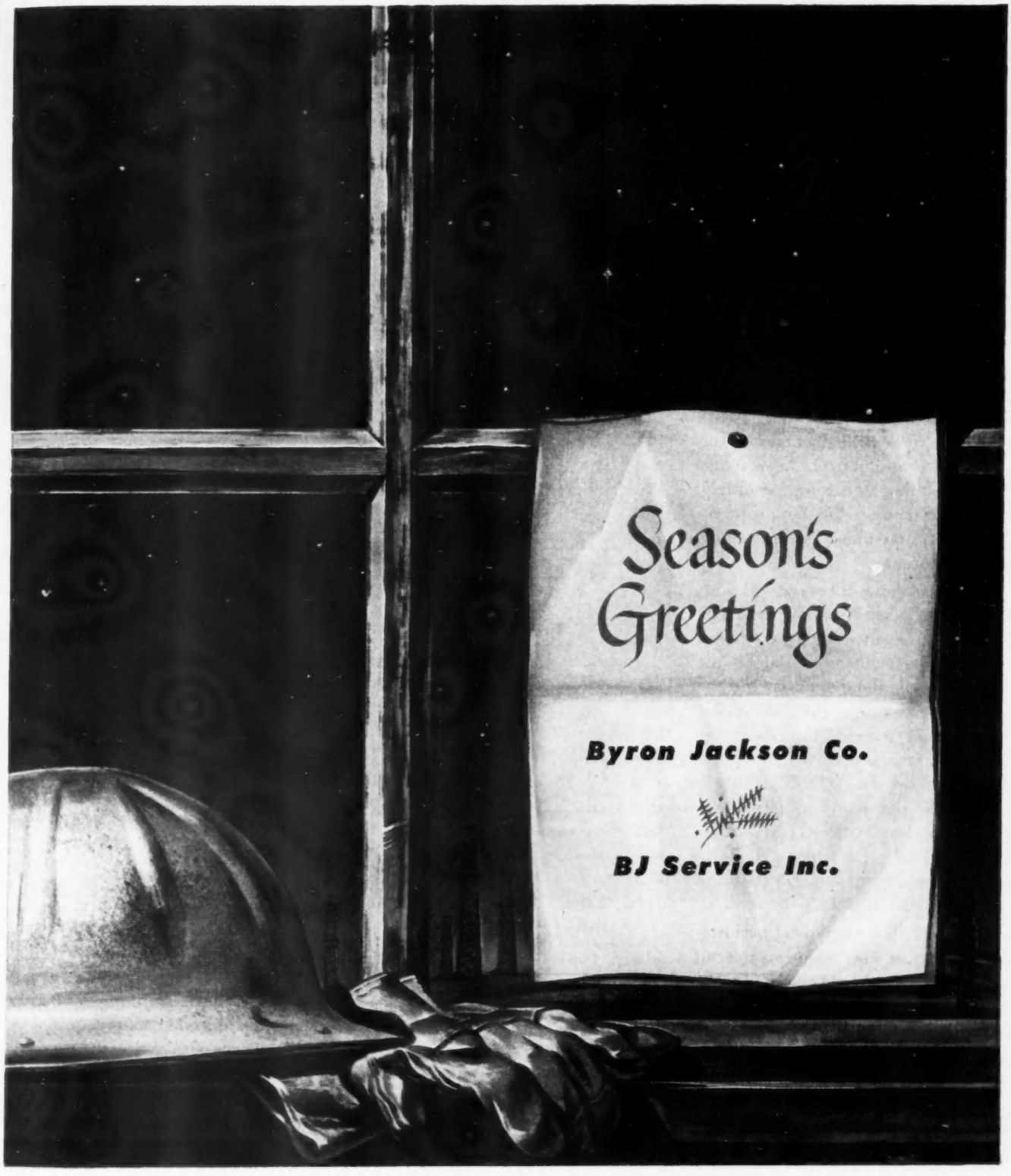



FIGURE 13

MERRY CHRISTMAS

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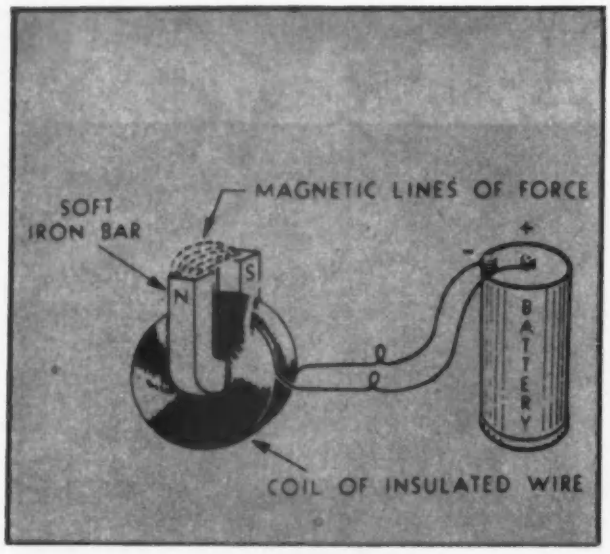


FIGURE 14

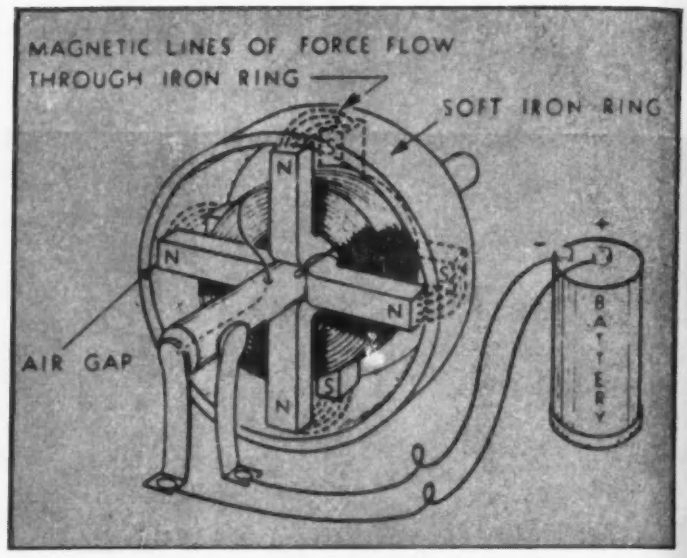


FIGURE 15

change direction several times imparting to the driven member, called the turbine, the addition of the reaction torque resulting in a torque multiplication. Of course the speed is reduced correspondingly with the increase of torque.

Figure 10 shows a cutaway view of a three-stage torque converter. The fluid is thrown outwardly by the pump which is the element similar to the impeller of the fluid coupling and the fluid then passes over the first turbine stage. Upon leaving this stage the fluid then passes over the first reaction member reversing the direction of the flow of this fluid, permitting the fluid to pass over the second turbine stage, and so on to the second reaction member and through the third turbine stage completing the circuit.

Figure 11 shows a typical performance curve of the torque converter we have just described. A torque multiplication of approximately five times is possible in this converter when the output shaft is stalled. The maximum efficiency varies upwards of 85 percent and the torque converter is usually applied so that it operates in a range of 70 percent or better efficiency. The reason for this is that the torque converter manufacturer supplies a means for cooling the torque converter fluid with a capacity of somewhat over 30 percent of the HP capacity of the torque converter.

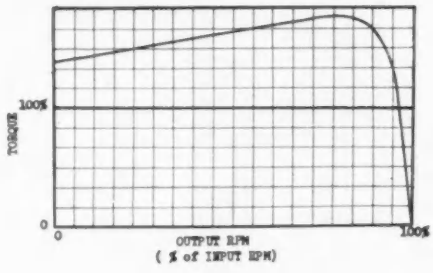


FIGURE 16

It is of great interest to note the broad range that is possible when this converter is operated at a minimum of 70 percent efficiency. The engine, it can be noted, is not stalled and is merely pulled down near the point of maximum torque when the output shaft is stalled. It is noticeable then that the engine functions in a speed range which permits high horsepower delivery although the requirements on the driven equipment may vary.

A typical drawworks performance curve is seen in Figure 12. This chart shows the single line pull available over a line speed range with a two-speed drum. A constant horsepower is plotted and the area between the curves and the constant horsepower curve represents the power loss due to the inefficiency of the torque converter.

The torque converter is ideal for hoisting as it permits a transmission of high accelerating torque to the drum at the start of the pull. As the string is pulled into motion, a lesser amount of torque is required with the result that the string moves faster providing uninterrupted acceleration of the load. The net result of this feature is that, during the course of pulling pipe out of the hole with a constantly varying load and with frequent starts, appreciable pulling time may be saved. Figure 13 shows the difference of pulling time required on a drawworks with and without torque converters. These curves show the actual experience of the same rig with and without converters and the shaded area between curves represents the saved time when using converters.

The torque converter has long been used in the oil field on independent rotary drives. In this application as we have explained before, it is extremely difficult to determine the

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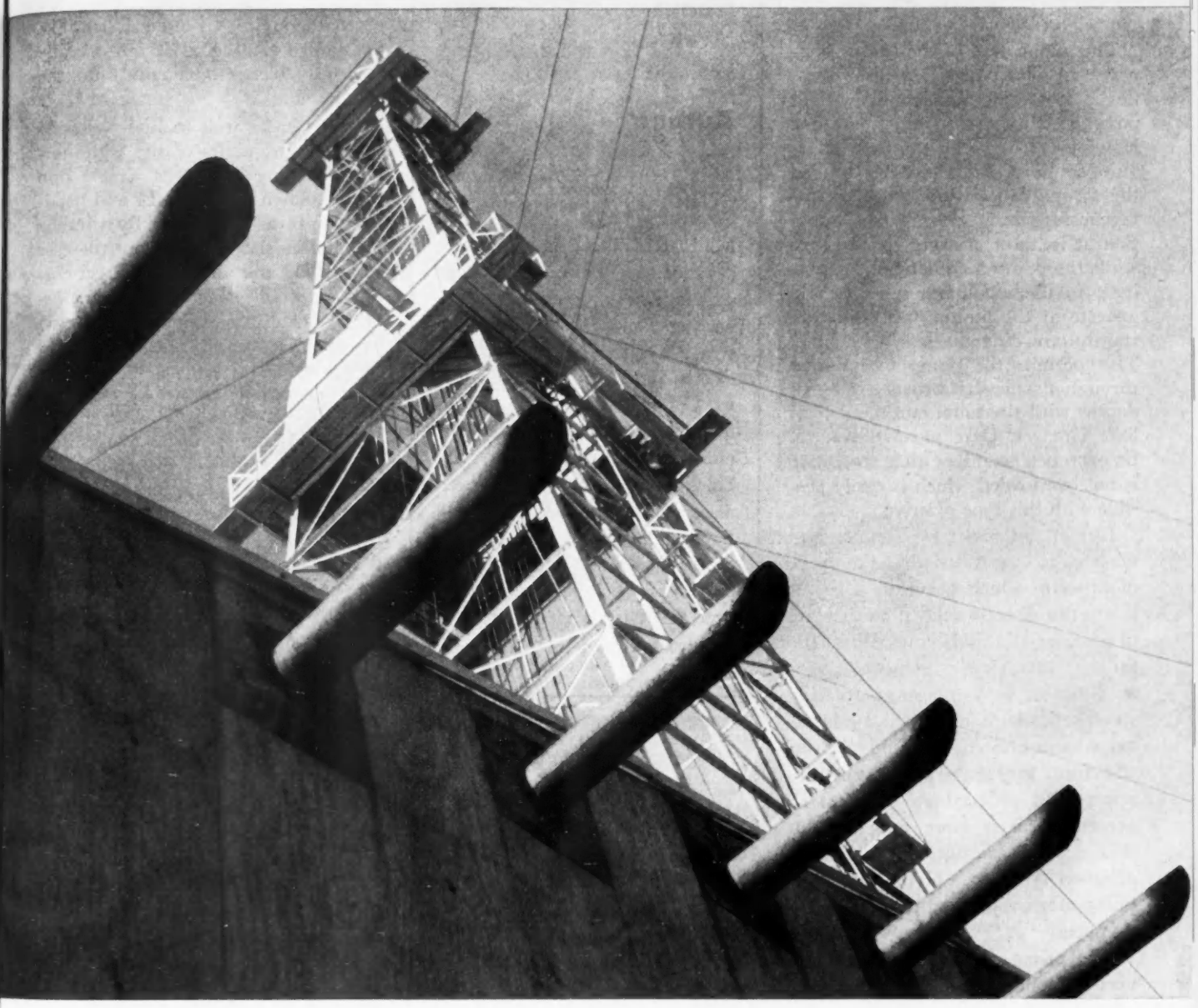
# Three D386s on the firing line at Pincher Creek



Three V-type Caterpillar D386 Diesels were selected to power this rig at Pincher Creek, Alberta, Canada, because of their ability to produce in rugged going. Look at the conditions they work under, 24 hours a day, 365 days a year:

Temperatures from -30° to 80° F make Pincher Creek "one of the toughest fields to drill in."

Authority for the last statement is N. Cairns, tool pusher for Commonwealth Drilling Co., which owns the rig. He explains: "Very hard formations which slope make it difficult to keep the hole straight. We are drilling to 13,000 or 15,000 feet through Madison lime. It's one of the toughest fields but *we find the D386s very reliable.*"

Top to bottom drilling takes approximately one year. "When we are pulling out of the hole at deep depths," continues Mr. Cairns, "we compound the three engines on the drawworks and have ample power. At over 11,000 feet we can make a round trip in less than 8 hours and still make some hole on the shift."

These reliable Cat* D386 Oilfield Engines power two slush pumps and a National Drawworks, a converted steam unit which is one of the largest in Canada.

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actual power requirements. The torque converter permits the rotary to turn, crowding the drill string, and smoothly overcoming varying torsional resistance.

The application of the torque converter to mud pumps has been questioned at considerable length by both pump manufacturers and operators. However, today this application is quite common and if properly applied the torque can be somewhat advantageous. It permits the engine to function at its most efficient speed range while the pump automatically adjusts itself to the maximum speed it will operate at the limiting pressure constantly crowding the hole with mud. This permits the pump to function through a somewhat broader range of depths with the minimum number of liner changes. Care must, of course, be exercised to insure that the pump is not overloaded which is easily possible with this type of drive.

In a recent paper by Toomey and Chilton, it was stated that the peaks of pressure which occur in a power pump are directly related to the rate of change of fluid flow. With the torque converter the pump seeks not to function at a constant rotating speed as is characteristic of the internal combustion engine prime mover, therefore, the peaks of pressure are appreciably reduced up to about 50 percent. This is more noticeable at slower speeds because of the reduced effect of the inertia of the drive, the pump mechanism, and the fluid being pumped.

The prime advantage of the converter application is that it provides a medium such as the fluid coupling which can effectively reduce shock loads. Recently Schaefer and Winter reported in a paper that a prolonged study was made of torque converters applied in off-highway heavy duty trucks in which a comparison of overhaul and maintenance expenses was made between such trucks having standard mechanical transmission and those using converters. This study showed that 47 percent greater engine life, 400 percent greater transmission life and 93 percent greater differential life was obtained with the converter equipped trucks. A similar, but not probably as great, increase in life expectancy is undoubtedly applicable to drawworks which are powered through torque converters as high stresses are developed during the hoisting operations. Where hoisting is the predominant function, the use of the torque converter is well justified.

The following additional advantages may be cited for the torque converter:

- As with the fluid coupling torsional vibrations from the engine crankshaft are smoothed out.
- The fluid medium acts as a check to reduce the effect of the transferral of peak loads to the engine or equipment.
- The engine cannot be stalled and at the point of converter stall the engine is pulled down only slightly. The engine, therefore, cannot be lugged.
- Partial throttle operations are possible throughout the entire speed range of the engine.

**About the Author**

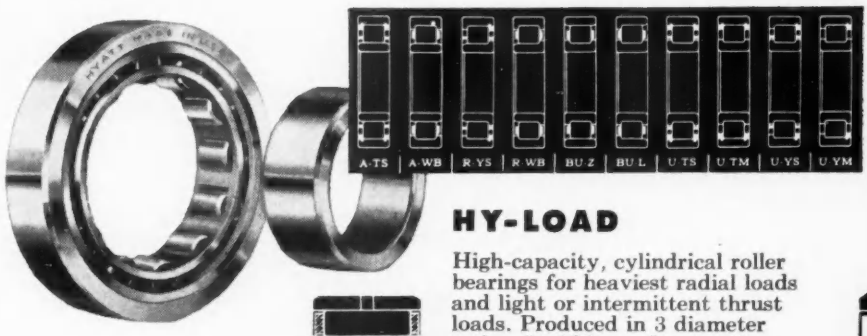
M. L. RIZZONE is a graduate of Indiana Technical College with a B.S. in mechanical engineering. Following graduation he was associated with Ajax Iron Works and Uniflow Manufacturing Company. He had 18 months in military service with the Armored Board, Fort Knox, Ky. Since April of 1942 he has been associated with the Oil Well Supply Division of United States Steel Corporation. He now holds a position of development engineer for this company. He is a member of the ASME.

**Eddy Current Coupling.** The transtransmission of power with the eddy current coupling is gradually finding its place in the oil field. The eddy current coupling is used much like the fluid coupling as it is generally placed between the engine and the compound.

It would be well to review briefly the basic principles of the eddy current coupling by taking a soft iron bar as shown in Figure 14 and bending it into a "U" shape. By winding a coil of insulated wire about the base of the "U" and allowing a direct current to energize the coil, the bar becomes an electro-magnet. When several such electro-magnets are inserted in a single coil and mounted on a shaft as seen in Figure 15, and with the addition of a solid ring of soft iron surrounding the magnets, the basic construction of the coupling is simulated. The magnetic lines of force will flow through the iron ring rather than the air surrounding as they have a much greater preference for the iron.

With the coil energized and the field assembly rotated, that is, magnets and coil, eddy currents are induced in the iron ring. These eddy currents oppose the relative rotation of the field and ring and, therefore, the force which they set up in the iron ring tending to rotate it with the field produces a torque transmission. As eddy currents exist only where there is relative rotation, these couplings, just like fluid couplings, require slip to function and are designed to operate normally with 3 percent to 5 percent slip.

The eddy current coupling responds instantly to varying excitation of the coupling field. Therefore, close sensitivity is obtainable in its control. A typical performance curve for this coupling is shown in Figure 16. The point at which the curve crosses the 100 percent line is the design point at which the coupling transmits the rated torque. The top point of the curve is the peak torque and the stall torque can be seen to be substantially above the rated torque. The control may be so arranged that the couplings do not transmit torque until the engines have come to the speed at which they develop maximum torque, thus the engines cannot be loaded at idling speed. This allows the un-

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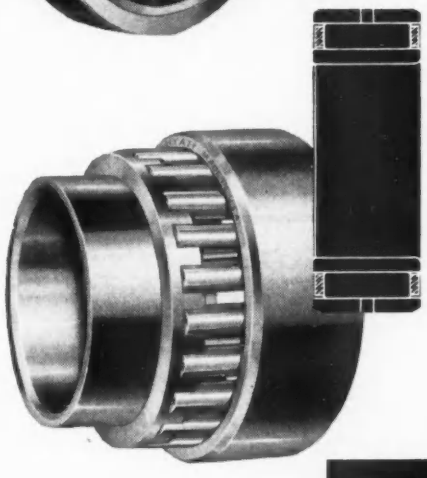

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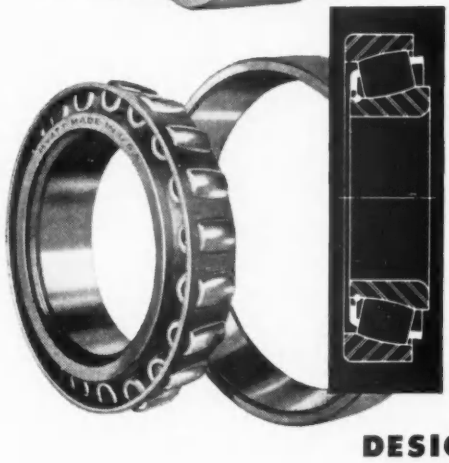

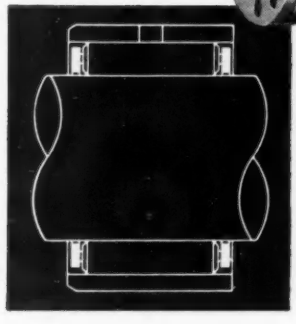

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loaded engines to accelerate quickly. It is also possible by turning a control knob to slow down the hoisting of the drill pipe or hold it at a standstill or even allow it to lower with the engines turning at full speed.

Because of slip these couplings develop heat which must be rejected. These couplings are provided with inlet and outlet connections which permit the flow of coolant, usually water, through the coupling housing.

As the eddy current coupling acts as an untuned damper when transmitting power, no oscillatory or torsional vibrations are transferred. While no equipment life expectancy data are available with the use of eddy current couplings, a definite increase in the wear life may be expected.

The various problems which are involved in the transmission of power on the modern rotary rig using internal combustion engines have been discussed. Without doubt human preferences as well as cost considerations influence the selection of the drive arrangement. Where a study is made of the nature of the connected load, the proper power transmitting medium may be selected. While the transmission of power with internal combustion engines requires generally a friction coupling medium, usually it may well be justified to consider the use of fluid or electro-magnetic drives.

—**The End.**


ACKNOWLEDGEMENTS

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## Casing Can Be Cemented in Permafrost

■ CONTINUED FROM PAGE 122

sired flow. Upon continuation of drilling, minor quantities of drilling fluid continued to flow from around the outside of the casing. However, no further corrective action was taken and the hole was drilled to the next casing point.

The second string of casing was set at 1101 feet. Two different types of cement slurries were used in cementing this casing string. The first slurry consisted of standard portland cement mixed with water containing 8 percent sodium chloride solution. This was followed by a second slurry of oil well regular Type "C" cement mixed with water containing 8 percent calcium chloride in solution. The first slurry filled the annular space between the casing and the wall of the hole from the surface to a depth of 825 feet. The second slurry filled the remainder of the annular space from 825 feet to total depth. Drilling and testing operations were continued in this hole for a period of 82 days and no trouble was experienced with leakage of the drilling fluid around either of the casing strings.

**Case 4.** The first string of casing set in this hole was placed at 107 feet. The top two joints of this string were jacketed with larger diameter pipe and the string was cemented with a gypsum cement slurry. There was no leakage of fluid around the outside of this casing in any subsequent drilling operations.

At slightly below 1100 feet a second string of casing was run and cemented with two different slurries as in case three. Slurry number one was composed of standard portland cement mixed with water containing 10 percent sodium chloride in solution and occupied the annular space from the surface to a depth of 800 feet. Slurry number two consisted of oil well Type "D" cement mixed with water containing 4 percent calcium chloride in solution and occupied the annular space from 800 feet to a total depth of approximately 1100 feet. No trouble was encountered with leakage of the drilling fluid through either of the cement jobs outlined above.

At 6050 feet a third string of casing was run and set. Normal cementing techniques were used for cementing this casing with completely satisfactory results.

**Case 5.** This well was unusual in that the casing string was run and set after the hole was filled with oil. During the drilling of a core hole, a flow of oil was encountered in the permafrost section. To furnish a flow channel for this oil, a string of casing was set to a depth of 350 feet using a gypsum cement slurry. No trouble was encountered with leakage of fluids around the outside of this casing although a certain amount of contamination of the slurry with oil must have occurred while it was being placed in position.

In the five cases which have been discussed, gypsum cement slurries were used for five casing strings cemented at depths of less than 400 feet, with only one indicated failure. In two of the five cases, casing strings were cemented through the permafrost section, using slurries mixed with water containing adulterants, and both were successful.

Although it is difficult to determine the cause of the failure in case three, several factors may have contributed to this failure:

- Channeling of the slurry through other fluids in the hole,
- Contamination of the slurry with other fluids,
- Existence of cavities preventing a fillup of the annular space and which also would contribute to the difficulties of one and two.

Cases presented above show that with proper materials and techniques successful cementing jobs can be achieved in setting casing strings in frozen formations. Use of cements at low temperatures such as those existing in the Arctic region is of vital concern to construction engineers. This is particularly true where solid foundations are needed for mounting heavy equipment and machinery.

—**The End.**


ACKNOWLEDGMENT

Acknowledgment is made to the director of Naval petroleum reserves for permission to publish this paper and to the Petroleum Engineering Department of the University of Oklahoma for permission to use data included in a thesis presented to the university.


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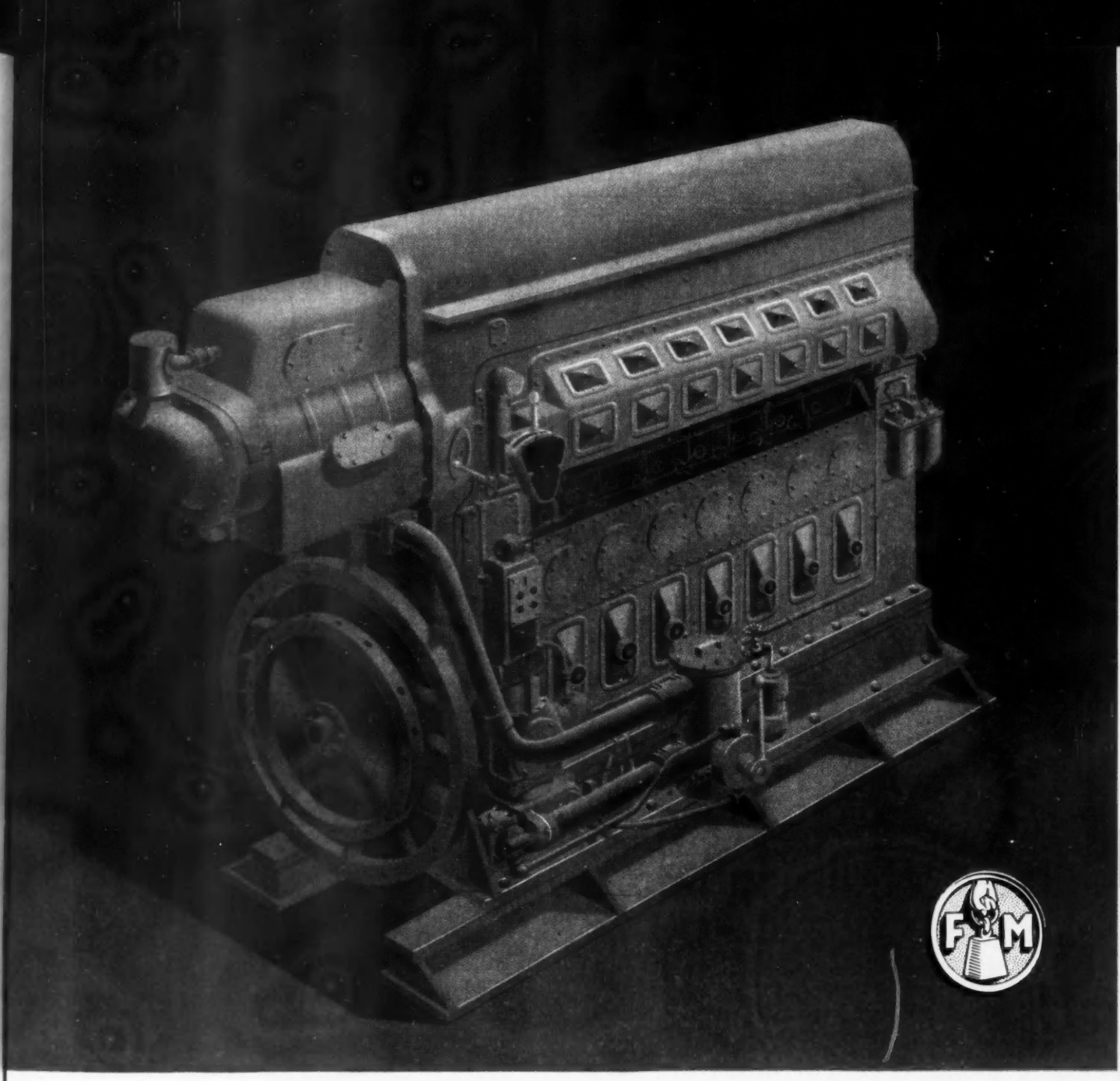

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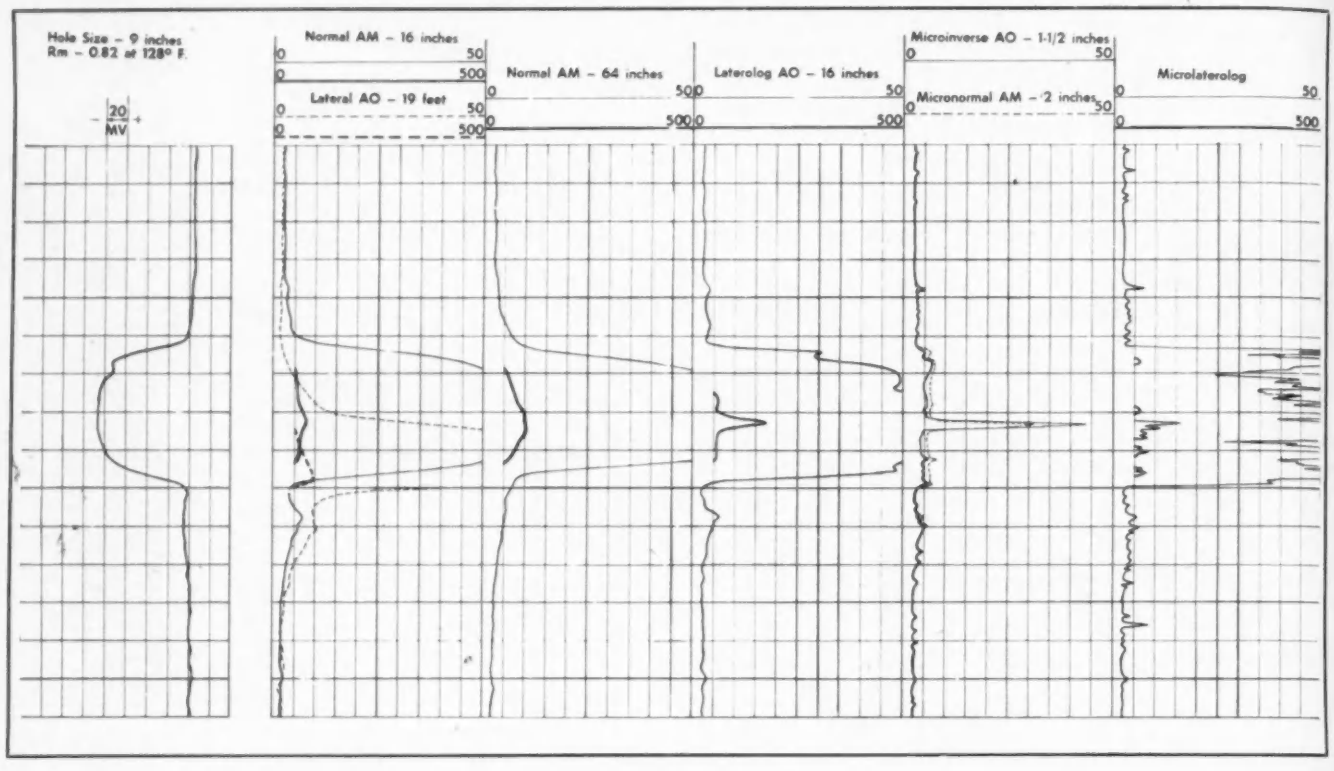
Hole Size – 9 inches
Rm – 0.82 at 128° F.
20
MV
Normal AM – 16 inches
Lateral AO – 19 feet
Normal AM – 64 inches
Laterolog AO – 16 inches
Microinverse AO – 1-1/2 inches
Micronormal AM – 2 inches
Microlaterolog

FIGURE 1

# New Well Logging Developments

- **Where they work**
- **When to use them**

**By L. A. PUZIN,** Schlumberger Well Surveying Corporation, Oklahoma City

WITHIN THE LAST few years, considerable progress has been made in well logging. New tools and new methods of analyses have been introduced and tested. In this article, all new developments are summarized and appraised for their application to Oklahoma problems. The conclusions are applicable in other areas where similar conditions are encountered.

The following problems are currently studied for a possible solution by means of electrical or radioactivity methods.

1. Detailed logging: The problems of thin beds
2. Porosity determination
3. Oil and water saturation
4. Distinction between limey and oil bearing sands
5. Logging in salty mud holes
6. Logging in oil base mud and cable tool holes
7. Dip determination

**1. Problems of Thin Bed Logging.** Oil well surveying problems can be broadly grouped into two categories:

**Part 1**

• The problem of locating the various strata crossed by the bore hole, giving an indication of their nature, whether shale, sand, limestone, etc., and showing with an increasing precision the contacts between beds. The goal is to establish an accurate lithological description of the section under study.

• The problem of determining the fluid content of porous beds. The ultimate goal is to compute from physical measurements the amount of producible oil per acre-foot of oil bearing formations. When talking of oil bearing formations, we imply "oil or

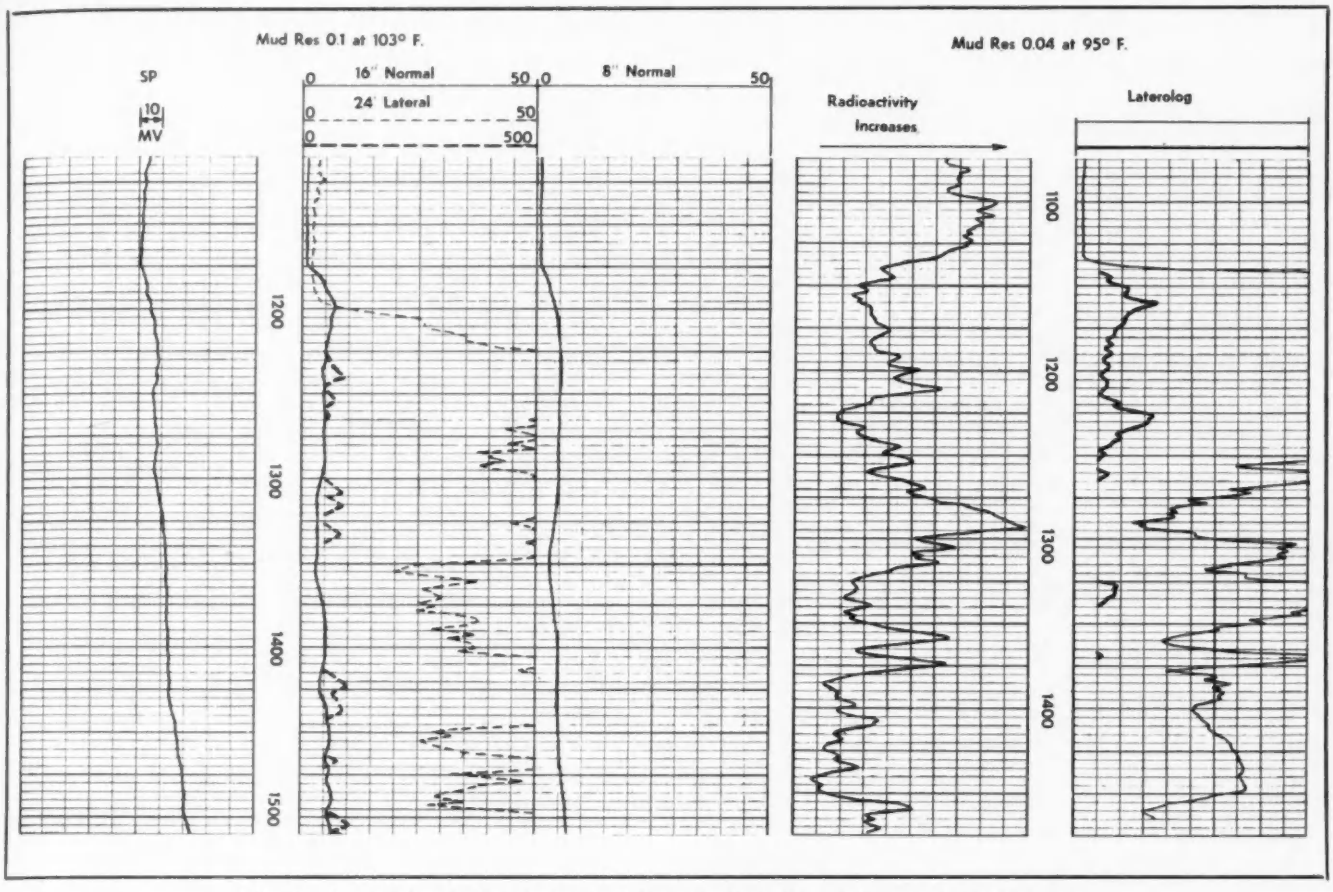


Fig. 2—Conventional electric log and laterolog in offset wells, western Oklahoma.

gas" inasmuch as, so far, oil cannot be distinguished from gas by electrical measurements.

Both problems were recognized ever since electrical logging was introduced to the oil industry, some 25 years ago. They have been partially solved particularly in the case of thick beds. By thick beds are generally meant those which are at least 10 and preferably over 50 feet thick. It can be contended that the stratigraphic logging and to some extent the fluid content determination of thick beds are now solved problems. The present efforts of well loggers are directed towards logging thin formations.

Thus, until about four years ago, well loggers had been thinking in terms of feet. Conventional resistivity devices did not log accurately or could even miss entirely formations less than about two feet thick. The first series of resistivity departure curves had been computed for formations at least 50 feet thick. Now loggers are beginning to think in terms of inches. This step is comparable to the changes in concepts brought to biological sciences by the invention of the microscope. Modern investigating methods have increased the "resolving power" of the logging science enabling the geologist to "see" on electric logs, formations a few inches instead of several feet thick.

How have such results been attained?

The increasing accuracy in logging thin beds was made possible by the introduction of new methods: microlog, laterolog, microlaterolog. For examples of these curves, see Figures 1 and 2.

THE MICROLOG[1] is a method which measures the resistivity of small volumes of material near and behind the wall of the bore hole. The very small electrode systems used are supported in the face of an insulator pad applied to the wall of the hole, and are thus practically shielded from the mud column. This method provides a very detailed and accurate record of the formations, particularly of permeable beds, down to a few inches thick.

THE LATEROLOG[2] makes use of a focusing electrode system which forces the current used for the measurement to penetrate the formations in the form of a sheet of limited thickness expanded horizontally around the bore hole. According to this system, the effect of the mud column is eliminated, and the influence of the formations above and below the current sheet is considerably reduced. This method therefore gives more detail than the conventional methods (its resolving power is of the order of a few feet). The laterolog is, at the present time, mostly used in wells drilled with high salinity mud, inasmuch as, in this case, it gives the true resistivity of the formations with a good approximation, provided the invasion of mud filtrate is not exceedingly deep.

THE MICROLATEROLOG[3] essentially utilizes a system of concentric circular electrodes imbedded in an insulating support which is applied to the wall of the hole. A beam of current of very small diameter (about 1 inch) is focused horizontally into the formations and then opens widely at short distance from the wall. The microlaterolog has a better resolving power than the microlog and it gives resis-

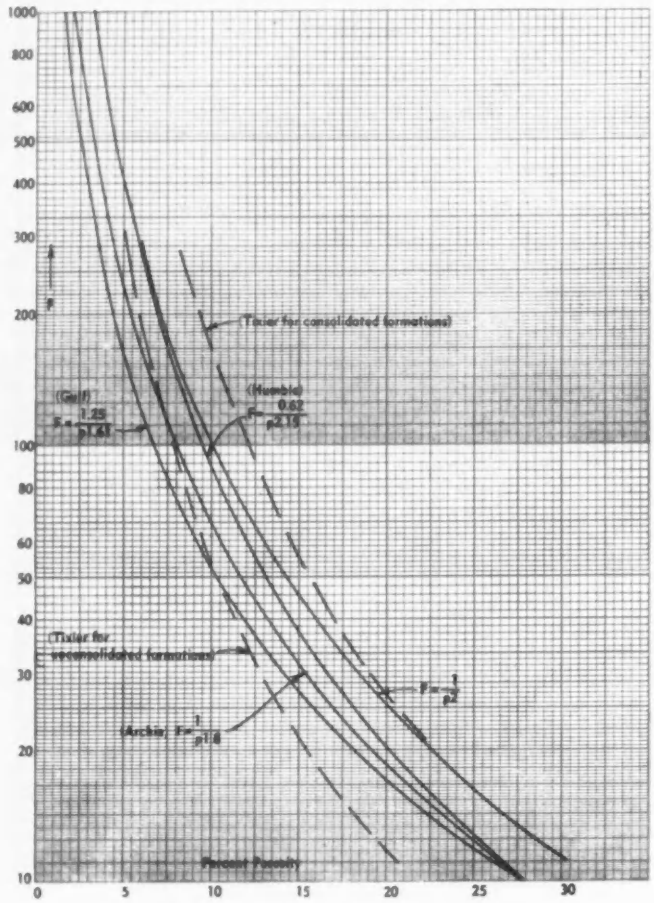


Fig. 3—Formation factor vs. porosity.

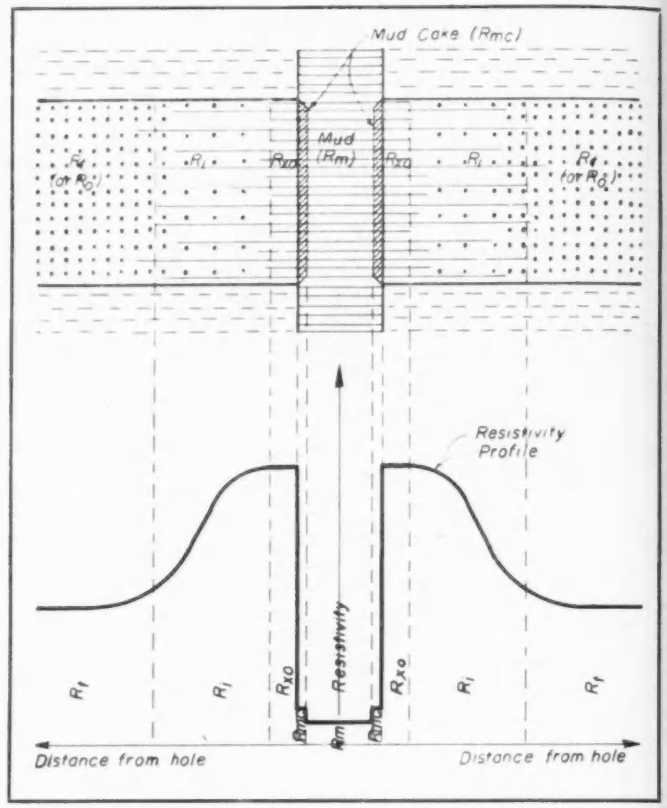


Fig. 4—Resistivity of mud-invaded zones.

tivity values which are better suited to quantitative analysis.

## 2. Porosity Determination.

Porosity Determination from Electric Logs. The use of electric logs to determine the porosity of a formation was attempted many years ago, particularly by G. E. Archie[4] in 1942 and M. P. Tixier[5] in 1949. The method is based on the simple relationship between the porosity and resistivity factor F of a formation. Such relationships and their expressing formulae are related to the case of formations substantially free from conductive solids. This is generally the case in Oklahoma although exceptions are known. Correcting methods to be applied to those exceptions are being studied at the present time.

The general expression of the relationship between porosity and formation resistivity factor F is:

$$\phi = \sqrt[M]{\frac{a}{F}} \text{ or } F = \frac{a}{\phi m}$$

where a is an empirical constant and m a cementation index. Figure 3 shows a plotting of the above formula for various values of a and m as determined by various workers. In Oklahoma where formation are consolidated, the formula $F = \frac{0.62}{\phi 2.15}$ seems to fit most cases. It was established by Humble Oil & Refining Company's engineers and is commonly referred to as "Humble Formula."

As defined by Archie,[4] the formation resistivity factor is the ratio between the resistivity Ro of a formation saturated by a brine and the resistivity Rw of this brine. It is expressed by the formula:

$$F = \frac{Ro}{Rw}$$

If we consider the zone of a formation which is invaded by drilling mud, or more accurately by mud filtrate, the above formula can be written:

$$F = \frac{Ri}{Rmf}$$

where Ri is the resistivity of the invaded zone and Rmf the resistivity of the mud filtrate.

The "mud invaded zone" is a rather vague concept inasmuch as part of the mud filtrate is mixed up with formation fluids remaining in the invaded zone. For a discussion thereon, see Tixier[5] and Doll.[1] However, if we consider the part of the invaded zone within two or three inches beyond the hole wall, we may assume that in this narrow annulus, the mud filtrate has practically flushed all the connate water and most of the oil—if any. The resistivity of that mud invaded zone close to the hole wall, was called by Doll[1] Rxo. Figure 4 shows a graphic representation of the various zones of mud invasion and the relative resistivity of each concentric layer.

In the zone of resistivity Rxo as previously defined, we have:

$$F = \frac{Rxo}{Rmf}$$

Mud filtrate resistivity Rmf is easily obtained from Mud Resistivity. See Doll[6] for a tabulation of these data. Consequently, the determination of the porosity is reduced to the measurement of the resistivity Rxo.

The value of Rxo is given by the

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Even the 100′ Mast with 15′ width at the bottom, will accomodate any draw works that will drill to 8000′, and leave plenty of working space on the mast floor.

## PORTABILITY

The 100′ mast can be transported on 3 to 4 trucks. A maximum of 5 trucks will carry the 131′ mast. Both masts can be skidded in the field without lowering.

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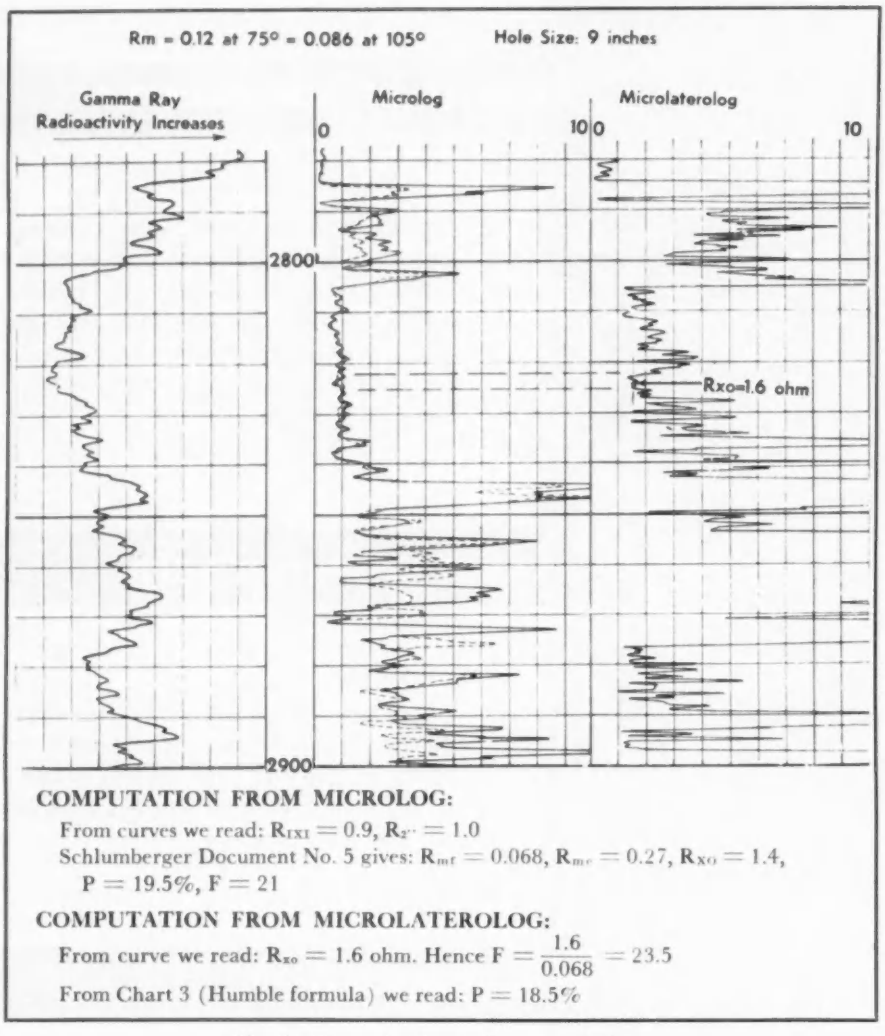
Rm = 0.12 at 75° = 0.086 at 105°
Hole Size: 9 inches
Gamma Ray
Radioactivity Increases
Microlog
Microlaterolog
0
10
0
10
2800
2900
Rxo=1.6 ohm
COMPUTATION FROM MICROLOG:
From curves we read: R1X1 = 0.9, R2' = 1.0
Schlumberger Document No. 5 gives: Rmf = 0.068, Rmc = 0.27, Rxo = 1.4,
P = 19.5%, F = 21
COMPUTATION FROM MICROLATEROLOG:
From curve we read: Rxo = 1.6 ohm. Hence F = 1.6 / 0.068 = 23.5
From Chart 3 (Humble formula) we read: P = 18.5%

Fig. 5—Example of porosity computation.

microlog, in favorable conditions, i.e., when the porosities are not too low. The new method of the microlaterolog, which has been quite recently introduced into practice, seems to give appreciably more accurate results over a wider range of porosity values.

See Figure 5 for examples of porosity determinations.

POROSITY DETERMINATION FROM NEUTRON CURVE. With the equipment used in neutron logging, the amount of gamma rays induced by bombarding a formation with neutrons and which is received by the counter, is the smaller as the concentration of hydrogen atoms in the formation is the greater. Hydrogen is a component of all formation fluids either water or hydrocarbons. Consequently, the more porous is the formation, the less gamma rays are received by the counter. Hence, the neutron curve is a reflection of porosity.

The neutron method requires the empirical determination of several constants and factors, but when this is done, porosity can be obtained with great accuracy. For more details on the process, see R. E. Fearon and E. S. Mardock,[7] also C. B. Scotty and E. F. Egan.[8]

### 3. Oil and Water Saturation

The determination of water saturation is based on the resolution of the well known Archie Formula, i.e.:

$$S_w = \sqrt[n]{\frac{FRw}{Rt}}$$

The value Sw being the percent proportion of water in porous space, the balance is assumed to be oil and/or gas. The water saturation thus obtained is expressed in decimal fraction. Consequently, the oil saturation is 1 — Sw.

The "Archie Index" n is practically always close to 2. The determination of Factor F has been explained in Section 2, relative to the derivation of porosity from electrical measurements. Formation water resistivity Rw is either calculated from the SP log as explained in Tixier[5] or taken out of the Oklahoma salinity charts.[9] Therefore, the only factor needed to solve the above equation is the true resistivity Rt of the formation. The endeavor to determine true from apparent or measured resistivities has resulted in considerable mathematical and laboratory works. The departure curves furnished the most comprehensive data on the subject. However, such curves have their limitation particularly in the case of thin beds. Consequently, more work is being done in an attempt to either measure directly the formation resistivity or complete the sets of departure curves.

The newest approach to the problem make use of the following methods:

- Laterolog
- Induction logging
- Use of microlaterolog values to increase the accuracy of departure curves by reducing the number of possible solutions due to the "Equivalence Principle."

(When using the departure curves for invaded formations, both the resistivity of the invaded zone and the radius of invasion must be assumed. This may result in obtaining several values of the true resistivity satisfying any given set of apparent resistivities. The radius of mud invasion can only be guessed but the knowledge of the mud invaded zone resistivity from the microlaterolog restricts the number of possible solutions.)

**End Part 1**


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ACKNOWLEDGMENT

The author is indebted to M. Martin of the Schlumberger Research Department for his judicious suggestions. He is also grateful to M. P. Tixier, R. R. Rieke and C. K. Ruddick for their help and advice.

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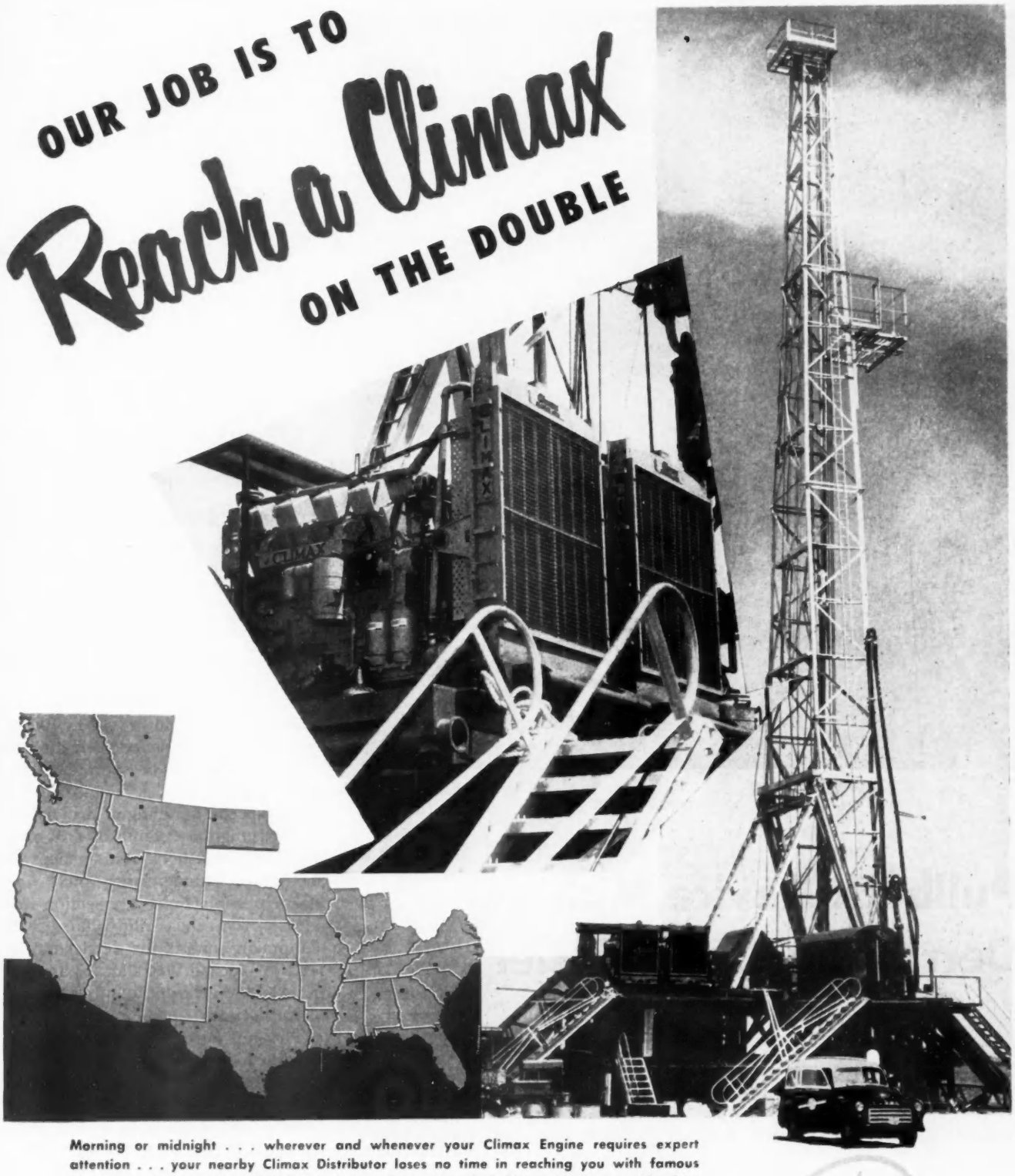


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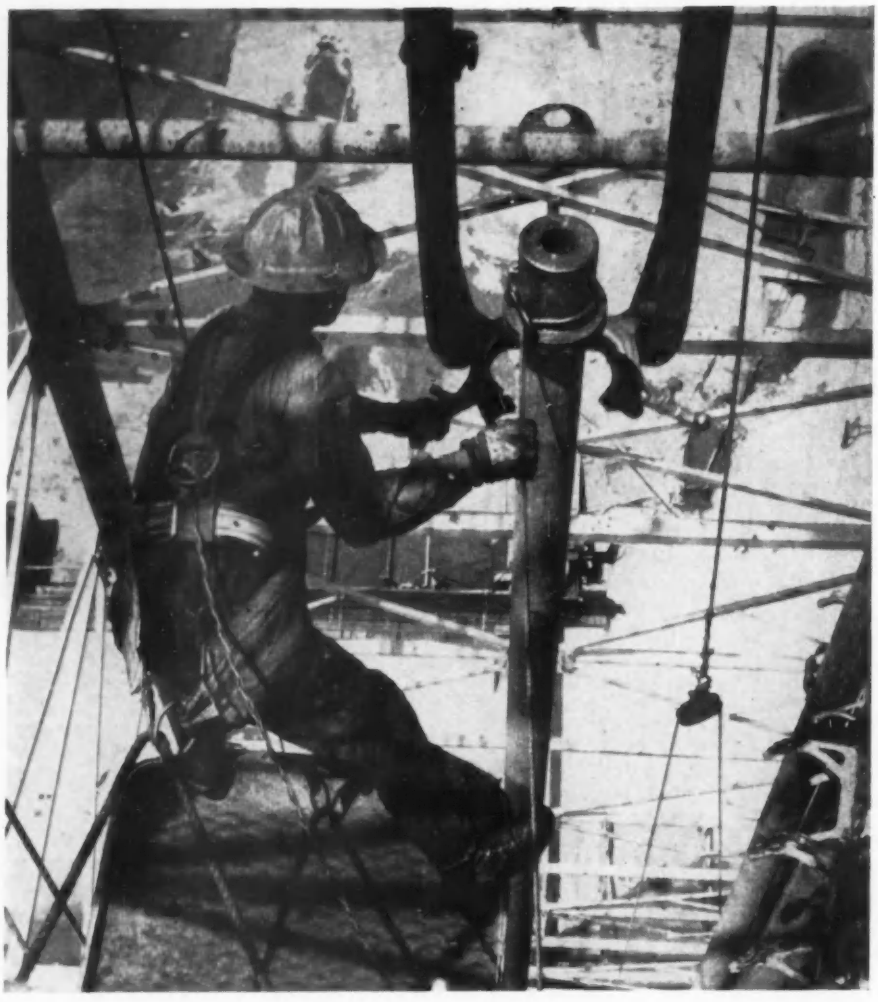

**Fig. 1**—Derrickman is shown latching on with elevators. Air hoist may also be used for recapturing stands blown to other side of derrick by high winds. It also can be used for moving fourable board equipment into position.

# Pullback Device Making Derrickman's Job Easier

**An air hoist mounted in the derrick can speed handling of drill collars, save trip time, and increase safety.**

HANDLING OF DRILL collars by the derrickman has been implemented by air hoists. Units installed in West Texas by Humble Oil & Refining Company are making the derrickman's job easier and have reduced rig time and increased safety during such operations. Cost is about $900.

It has become a standard practice in West Texas to run from 12 to 20 drill collars to provide sufficient bit weight for drilling hard formations. This new tool minimizes physical fatigue and will be a welcome aide to the derrickman. No more catlining to worry about. No more special rigging to handle drill collars.

Advantages of the air hoist:

- The method is faster and will save rig time.
- The adjustable features allow spotting of drill collars in any position without too great a physical effort on the part of the derrickman.
- The derrickman retains fingertip control over drill collars, eliminating the hazard of poor coordination between the man on the cathead and the man in the derrick.
- The installation is compact, easily installed and eliminates the need of rigging up to handle drill collars.

Installation consists of an automatic braking air hoist clamped to the derrick leg at the level of the derrickman. A perforated beam is formed of two welded channel irons. A sliding pulley support block is pin mounted on the channel beam. The sliding block is box-shaped and is made of welded channel or flat iron which cannot fall, even when the pin is not in place. The sliding support arrangement permits the pulley to be spotted at any position from derrick leg to derrick leg for special handling of drill collars or retrieving loose stands of drill pipe. A chain and a hook arrangement on the end of a three-eighths-inch cable makes possible quick connection and release from the drill collars. Such equipment enables the derrickman to latch or rack drill collars of any size quickly and efficiently without undue physical effort.

The air hoist is self-braking and remains locked except when the cable is run out or pulled in by the operator. The rated capacity of the air hoist is 1000 pounds at a pressure of 80 pounds per square inch, with a lift speed of 75 feet per minute. In clamping the hoist to the derrick leg, which is a principal loading member subjected to compression, or column loading, care must be exercised that the leg will not be permanently distorted by the pull of the hoist. As a precaution, the hoist should be clamped to the leg so that the pull line will be as near a derrick girt as possible.

In routine trip handling of drill collars a special finger was devised for

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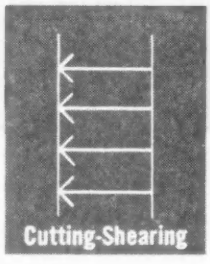

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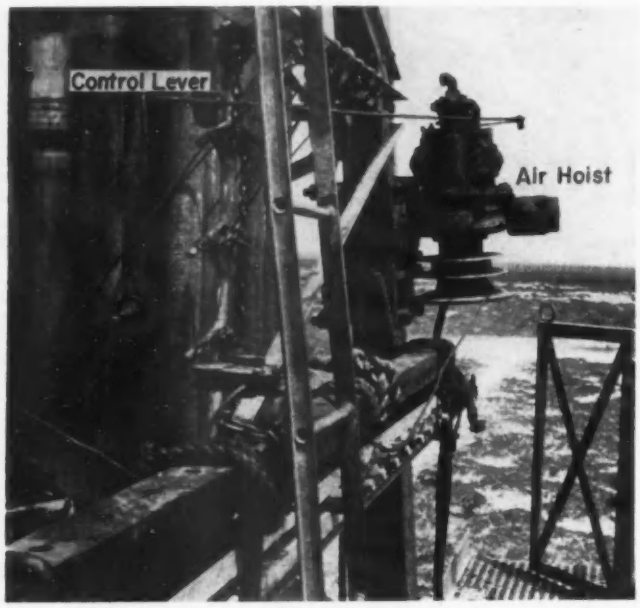



Fig. 2—Air hoist is bolted to derrick leg as shown and controlled by hand-control lever. Pulley shown riding spacer of derrick finger beam slides between two 4 by 1½-inch channels which have been welded together.

Fig. 3—Derrickman manipulates contol lever, pulling the drill collar into position. This installation is compact, easily installed and eliminates need of rigging up to handle drill collars.

racking the drill collar stands. Using this system with the air hoist, no waiting time is caused by the derrickman. Actual running time for 7¾-inch drill collars, other than the first stand, has been about 3½ minutes per thribble. Average pulling time, counting the last stand, has been 2¼ minutes per thribble. Similar averages have been accomplished for six-inch drill collars. This is total elapsed time for all operations, including time to install drill collar clamp and lift sub.

After the air hoist and channel beam have been bolted to the derrick leg, the channel beam clamped to the finger beam, and the snatch block bolted to the finger beam, the wire line is passed from drum of hoist through the pulley where it is wrapped around a drill collar lift sub. As the drill collar stand is pulled into position, the derrickman operates the air hoist with a control lever with his right hand. As the derrickman pulls the drill collar stand into position, the elevators are latched below the lift sub and the hoist has saved the derrickman a weary hour.

The beam on which the sliding support for the pulley is mounted is clamped to the derrick legs as shown in Figure 2. An alternate method of using a shorter beam is to clamp on top of the finger beam. Figure 3 illustrates the sliding support and pulley arrangement. Figure 1 shows collar pulled into position and being latched.

This installation goes far toward providing a safe and efficient tool for the derrickman. —**The End.**

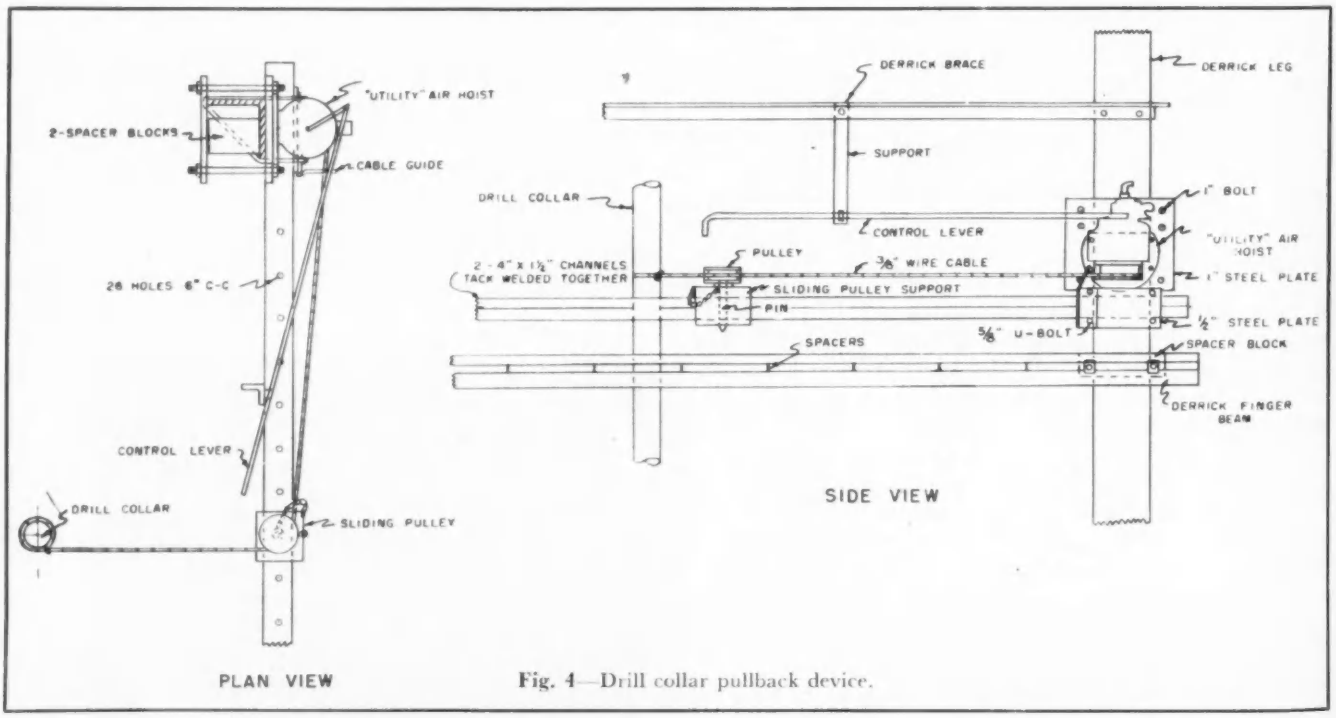
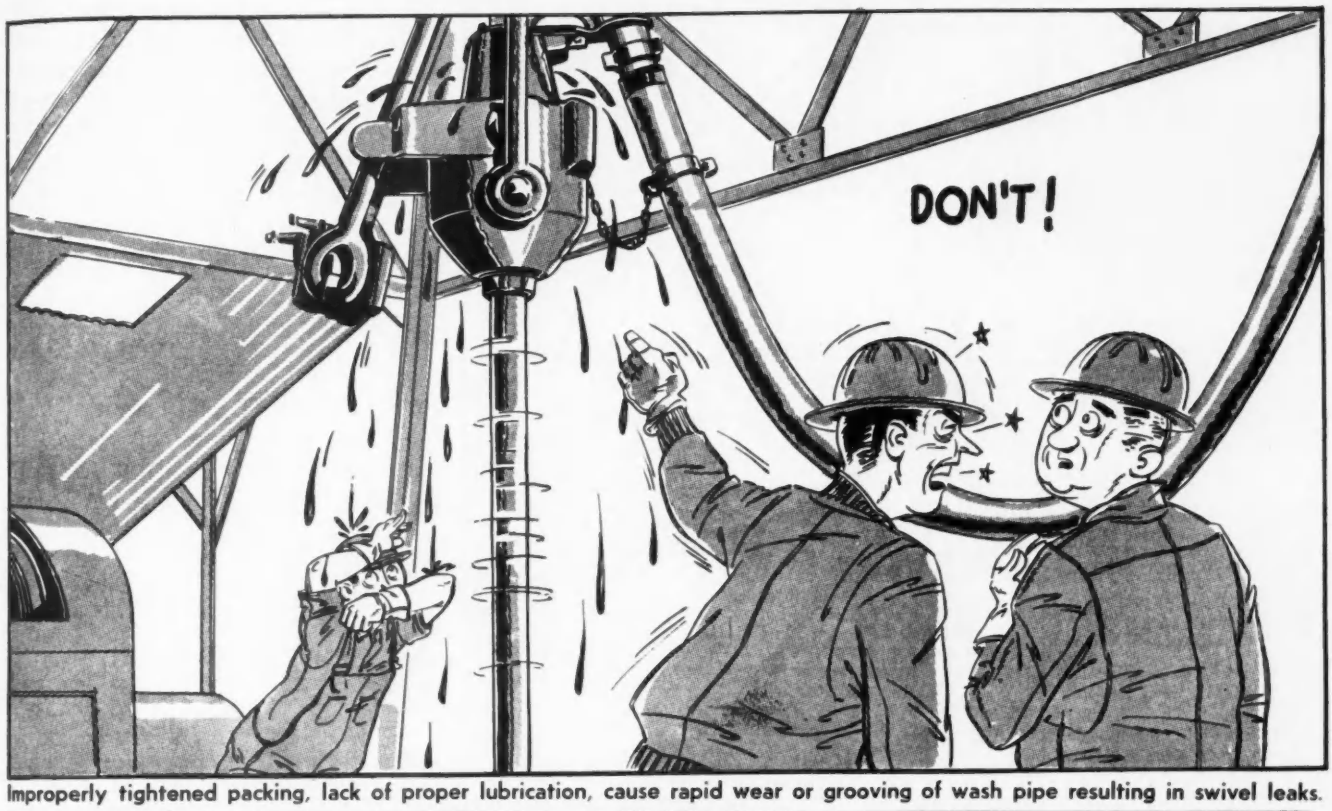


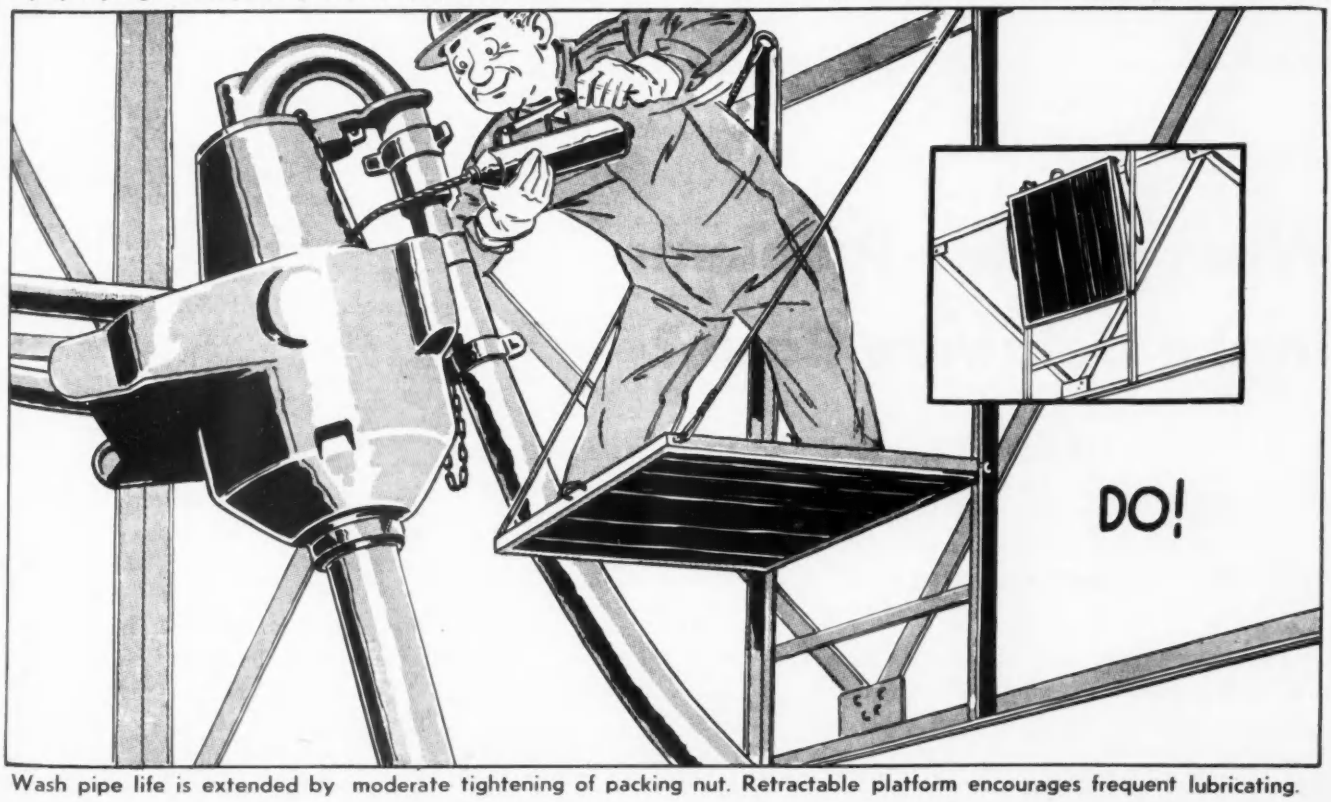

Fig. 4—Drill collar pullback device.

# World Oil Graphics

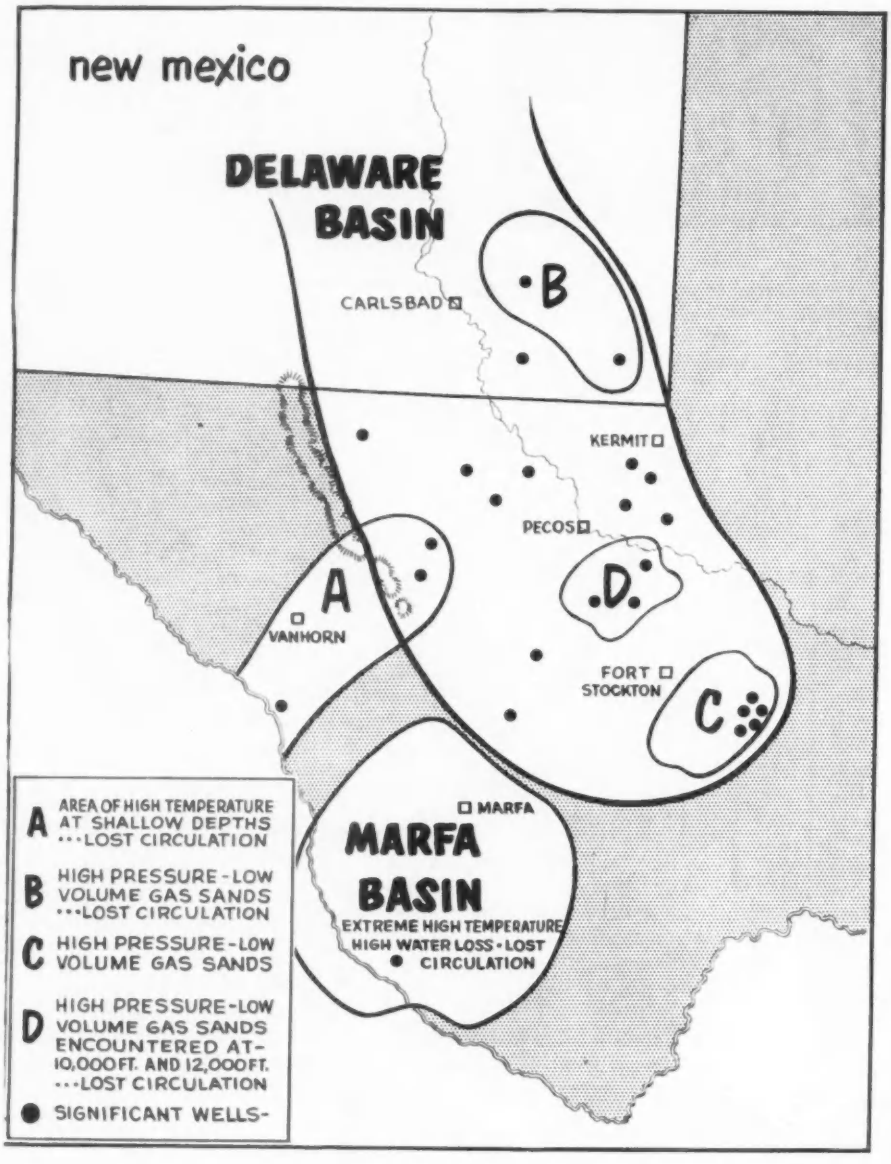
## Swivel Care




Improperly tightened packing, lack of proper lubrication, cause rapid wear or grooving of wash pipe resulting in swivel leaks.




Wash pipe life is extended by moderate tightening of packing nut. Retractable platform encourages frequent lubricating.




# What Are the Problems In the Delaware Basin?

**WORLD OIL asked the experts. Here are their answers.**

**By PHILIP L. McLAUGHLIN,** WORLD OIL Staff

LOST CIRCULATION and high-pressure but low-volume gas sands will be paramount drilling problems in the Delaware Basin—the remaining drilling frontier of West Texas and New Mexico. Limited exploration indicates that many drilling problems will be encountered.

- Lost circulation on the surface, and down deep.
- High temperatures at shallow and deep horizons.
- High-pressure but low-volume gas sands. Attempts to hold back these gases will lead to loss of circulation.
- Crooked holes.
- Sloughing shales.

Of necessity this article will cover the vast area in generalities only. The thousands of square miles comprising the Delaware Basin has been divided into areas of known hazards, keyed to the map as follows:

- Area A—High temperature at shallow depths and lost circulation.
- Area B—High-pressure—low-volume gas sands and lost circulation.
- Area C—High-pressure—low-volume gas sands.
- Area D—High-pressure—low-volume gas sands encountered at 10,000 feet and 12,000 feet and lost circulation problems.
- Marfa Basin—Extreme high temperature, and high water loss. Lost circulation problems.

**Area A.** In the Delaware mountain front area, on the extreme western edge of the Delaware Basin, north and east of Van Horn, Texas, lost circulation is so prevalent that most of the early and shallower drilling has been by cable tools. Rotaries have not been used to any extent until recently. Currently, companies performing exploratory drilling proceed as deep as possible with cable tools, after which the rotary is moved in.

One such well encountered 49 separate losses of circulation. The losses occurred between 3800 feet, the point at which cable tools moved off, and 6200 feet which was the rotary total depth in the Ellenberger formation.

The temperatures of muds in Area A are much higher than in the central platform. A well between Valentine and Van Horn had a flow line temperature of 170 degrees when drilling at 7000 feet. Circulation was lost at this point, and a dry test was run. A temperature bomb was lowered and recorded 270° F. bottom hole temperature. The water loss of the mud, composed of bentonite and water with lost circulation material, normally runs

about 12 to 15 cubic centimeters, but in this case was around 20 cc. After adding caustic-quebracho to this type of mud, irrespective of high temperature encountered, the water loss remained 20 cc. It may be concluded that it is tedious and expensive to lower the water loss in this mud.

Another well farther south and west in the same area, had a flow line temperature of 140° F. The bottom hole temperature has not been determined at this writing, but this mud is unlike the one mentioned above. The effect of temperature has not been felt in this well as yet since caustic and quebracho will still maintain about a 10 cc water loss mud. In this zone of high temperature sodium polyacrylate has thus far seemed able to withstand the effect of high temperature and provides a stabilized water loss control.

Area A is characterized by high temperatures at relatively shallow depths. The 140° flowline temperature above, occurred at 3500 feet, but did not increase over 6° in the next 3000 feet of drilling. It is significant to note that hot zones seem to be confined at past 3000 feet mark. Other wells in this vicinity have erratic temperature gradients.

**Marfa Basin.** High temperature wells are to be expected in a large portion of the Delaware Basin, and based on past experiences temperatures will be higher on the average than in any Central Basin well. These temperatures portend still more drilling difficulties in the future.

In the Marfa Basin, volcanic area, the wells drilled can be expected to be exceedingly hot. One such well drilled to 16,000 feet, recorded a temperature of 358° F. after burning up numerous surveying instruments. Various surveys proved unsuccesful, until special types of temperature equipment, guaranteed to withstand 400° F., was flown to the well site from the Gulf and West Coasts. Each instrument was run after the drill pipe had been run in the hole for conditioning which obviously entailed the circulation of cooler fluids through the hole. Perhaps it might take several days for equilibrium temperature to be accomplished. It is sufficient to say that the mud was hot enough to burn and to give considerable mud difficulties.

Extreme treating difficulties were encountered between 11,000 and 12,000 feet. The temperatures were high enough to cause a gel condition in the mud. In this well, the operators were faced with a rapidly rising water loss, on which the cellulose products, starches, caustic, and quebracho had no lasting effect. The mud was jelling so badly that operators were in constant danger of losing circulation. Due to such resistance, the mud was inclined not to circulate up the hole and hydraulic fracturing of the formation was a possibility. Plenty of thinners relieved the troublesome jelling action, and use of sodium polyacrylate overcame the problems of fluid loss control.

**Torquing Problem.** In some wells torquing becomes an important problem. On the Marfa Basin well mentioned above, it finally was overcome by addition both of diesel oil and graphite. The operators made no effort to determine which was the more effective, oil or graphite; they were only interested in saving their investment. So great was the torque, that the torque indicator broke. The torque was reduced from 9½ rounds of rotary table back lash to one-half round—after both oil and graphite had been added.

Oil was added—about 10 to 15 percent by volume, and 4 to 5 pounds graphite per barrel was added. In addition to reducing the torque, the indicator weight of drill pipe coming off bottom was reduced by 40,000 pounds, and the weight of the pipe going into the hole was increased by 20,000 to 30,000 pounds.

**Area B.** That part of the Delaware Basin extending into New Mexico can be expected to have many of the same problems that were enumerated in the parts of the basin extending into Texas—loss of circulation, particularly the type resulting from high-pressure, low-volume gas sands.

Obviously, in drilling a wildcat well, it is impossible to determine whether a sand is low volume at the time it is drilled. First inclination is always to hold gas pressure back with high weight mud, because it would be possible in a wildcat territory to have an expensive blowout if no effort was made to control it.

It is anticipated that future drilling will reveal gas sands in the Delaware Basin of sufficient importance to be both high-pressure and high-volume. When such sands are tapped, the operator may be in for a wild and expensive well.

In most parts of the Delaware Basin, when experiencing lost circulation due to high-pressure sands, it is possible to circulate muds that weigh at least 9½ to 10½ pounds per gallon. In very few instances have muds weighing more been circulated until a reasonably deep string of pipe has been set.

Up to this time, operators doing development and exploration work in the Delaware Basin, have not found a better way to drill other than to keep a sufficiently large hole so that they can set another string of casing. Casing the hole frequently proves necessary and at times seems to be the only means of overcoming formation weaknesses. Once the hole is cased, it is possible to circulate muds of sufficient weights to kill and hold back additional high pressure gas sands drilled. The deeper beds are more compact and do not tend to part along the bedding planes.

The weights have varied, but in almost no instance have they been less than 13 pounds per gallon and frequently run as high as 15 pounds per gallon. It is believed that there will be areas where 15 pounds per gallon will not be sufficient to control the pressures.

Areas A, B, C and D are considerably alike at greater depths, but in the shallower surface zones—a variety of conditions are present. Area A in particular is fractured by upheavals of nearby mountains and has a lost circulation horizon at 400 feet. At that point, either big honeycomb sections, caverns, fractures, or some type of a void which is very difficult to seal up is encountered.

When the usual sealing methods fail, the best solutions has been to dry

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drill several hundred feet, because other cavernous zones will be encountered. It is usually possible to drill ahead and circulate after setting casing at 1200 to 1500 feet.

Two or three wells in this general area have been dry-drilled from 1100 to 3200 feet. Frequently, drilling progresses for 200 to 250 feet before hitting another void. Other wells have been drilled to 3200 or 3300 feet without encountering porosity. Below this depth it is usually possible to run a light mud without further trouble until penetrating the high-pressure, low-volume gases, and then lost circulation problems result from overweight.

**Area C.** Mud programs in Area C do not vary much from those of other areas. Most areas are similar, except for encountering the gas at varying depths. The Delaware Basin does not contain much lime as does the Central Basin Platform. Past drilling indicates that the basin is predominantly shale, but so far these shales have not hydrated to the extent that they offer trouble. In carbonaceous shales, it is possible to run a low gel with a low viscosity somewhere around 60 seconds after weighting material is added.

In Area C at a depth of 8000 feet, the weight is raised to 10.8 pounds per gallon and 2 percent oil is added. When running a low solid content, low pH, CMC mud; only a small addition of oil is needed for stabilization. There is very little upkeep to the mud. With this mud weight there is some gas-cutting but the gas is dry and will break out in the first or second pit. It has been quite economical so far to change over to CMC low solid mud. It is not at all uncommon to use a very low viscosity (less than 40 seconds) with a water loss of 15 to 18 cc and a weight of 9 to 9.2 pounds per gallon above 9700 feet.

**Area D.** Area D comprises the lower part of Reeves and Pecos County, the center of Pecos County and Reeves just below Pecos, Texas. There have been three wells drilled in this area all below 12,000 feet. Each well has encountered high-pressure, low-volume gas in the neighborhood of 10,000 feet. These gas bearing sections have been controlled with 10 to 10.5 pounds per gallon mud. Another high-pressure, low-volume gas zone occurs around 13,000 feet which may require a 15-pound mud. Other than high-pressure, low-volume gas, the other mud problems are similar to the entire basin. There will be some shale trouble, but no high temperature or high water losses.

**Water for Drilling.** In the southern and western portions of the Delaware Basin one of the major problems for drilling contractors, operators and companies concerned is drilling water. Water for drilling wildcats and exploratory wells in this area will be very scarce and water-bearing formations are hard to find.

In the southeastern and central portions, water is plentiful and pure. Several contractors have tried to drill with water from the Pecos River. This has proved costly.

**Emulsion Muds.** In some instances, the use of emulsion muds has proved to be valuable; but until the geologist is given tools with which to differentiate crude oil from refined products in the samples, their use will be limited.

**Outlook.** Recent developments of the Delaware Basin of West Texas and southeastern New Mexico indicate that this relatively unexplored providence will be the next major producing horizon in the vast Permian Basin. Over 10,000 square miles of good prospective oil territory are available for exploration.

The purpose of this article is to present in generalities the known drilling hazards common to these five areas in the basin. The interviewees point out that this territory can not be covered in one attempt. Because of limited exploration, a statement that can be made about one part, may be diametrically opposed to conditions in another. Variety is the major feature of this basin, as operators will find from experience. —**The End**

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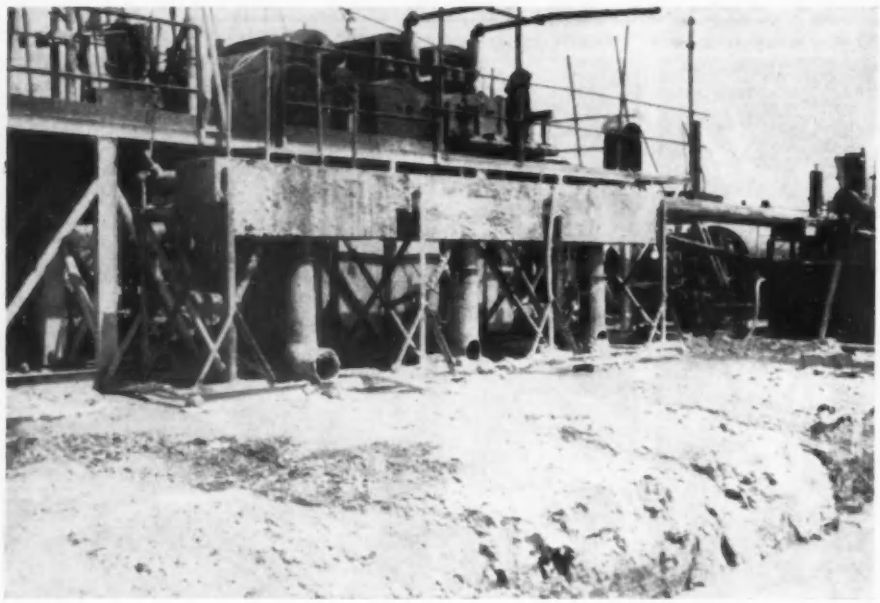

## Dumping Sand Through Downspouts

Precipitated sand, heavy cuttings and particles of shale which flow from the bottom of the hole are eliminated upstream from the shale shakers in quiescent sections of the "ditch" or mud flume. The flume which contains this apparatus was developed by Hoyt Drilling Company, of Long Beach, Calif., and is attached on one of its rotary rigs operating in the Edison field southeast of Bakersfield.

The flume is constructed in three identical units, each a quiescent zone, deeper than the connecting wier, so that an accumulation area is established for sand. In the bottom of each section a downspout extends to the ground through the supporting structure of angle iron. A quick dump valve is installed in the mouth of the downspout with a "T" handle extending upwards, with its shaft passing through a retaining bar crossing from one side of the flume to the other.

A projection on the shaft passes through a side-slot in the cross bar so that the operator locks the dump valve open by giving the "T" handle a quarter turn. Not only does this apparatus remove a large portion of the heavy material from the circulation, but can be used for dumping the entire circulation quickly when special muds must be used for a particular formation.

## Making Tool Box

Make a tool box which sets at rig floor level, from scrap material found around the welder's shop and provide convenient nipple and tool storage. A frame is welded from pieces of two-inch pipe, with the sides fabricated from tank plate steel welded tangent to sides of the pipe. The pipe is allowed to show on the edges giving a smooth appearance and prevents sharp corners from protruding.

Make the lid from floor plate material and weld to piano type hinges. Handles are made from sucker rod material which drops down at floor level when not in use.

A pipe frame on back of unit is used to hang occasional tools. It also carries a place for a hook to store feed in drilling line. A loading hook is welded to the center structural member of the top so that the box may be easily loaded.

# SEASON'S GREETINGS

H C Smith OIL TOOL CO.

"Finest Thread Protection" means using either of these WECO Compounds. They both exceed the requirements for maximum thread protection . . . for minimizing galling . . . for sealing without freezing. WECO Compounds require no thinner, will not harden, are not affected by hot or cold weather.

Give your tool joints and drill collars the finest thread protection and they'll give you longer, better service.

**NO-GALL 50% ZINC BASE**

**Those who prefer a zinc base compound should specify NO-GALL. It contains more than 50% pure metallic zinc.**

**LO-TORK 50% LEAD BASE**

**If you want a lead base compound, specify LO-TORK. It contains 50% finely screened metallic lead.**

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*It's Wise to Standardize with...* WECO ...

**WELL EQUIPMENT MFG. CORP.**
Division of Chiksan Company
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**CHIKSAN COMPANY**
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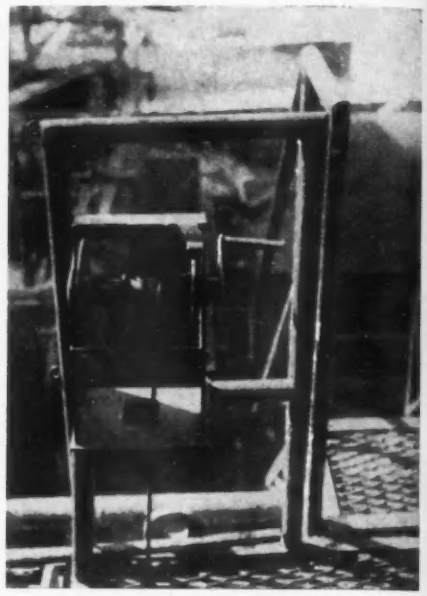
CHIKSAN EXPORT COMPANY, Brea, Calif. Newark 2, N. J.

Manufacturers and Distributors of Oilfield, Refining, Marine and Industrial Equipment

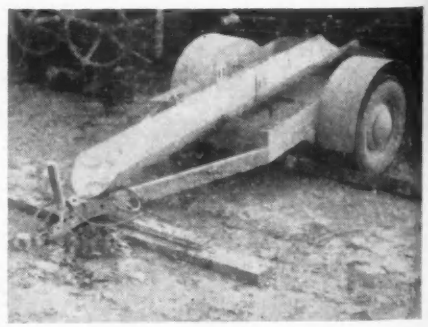


## Winching Suction

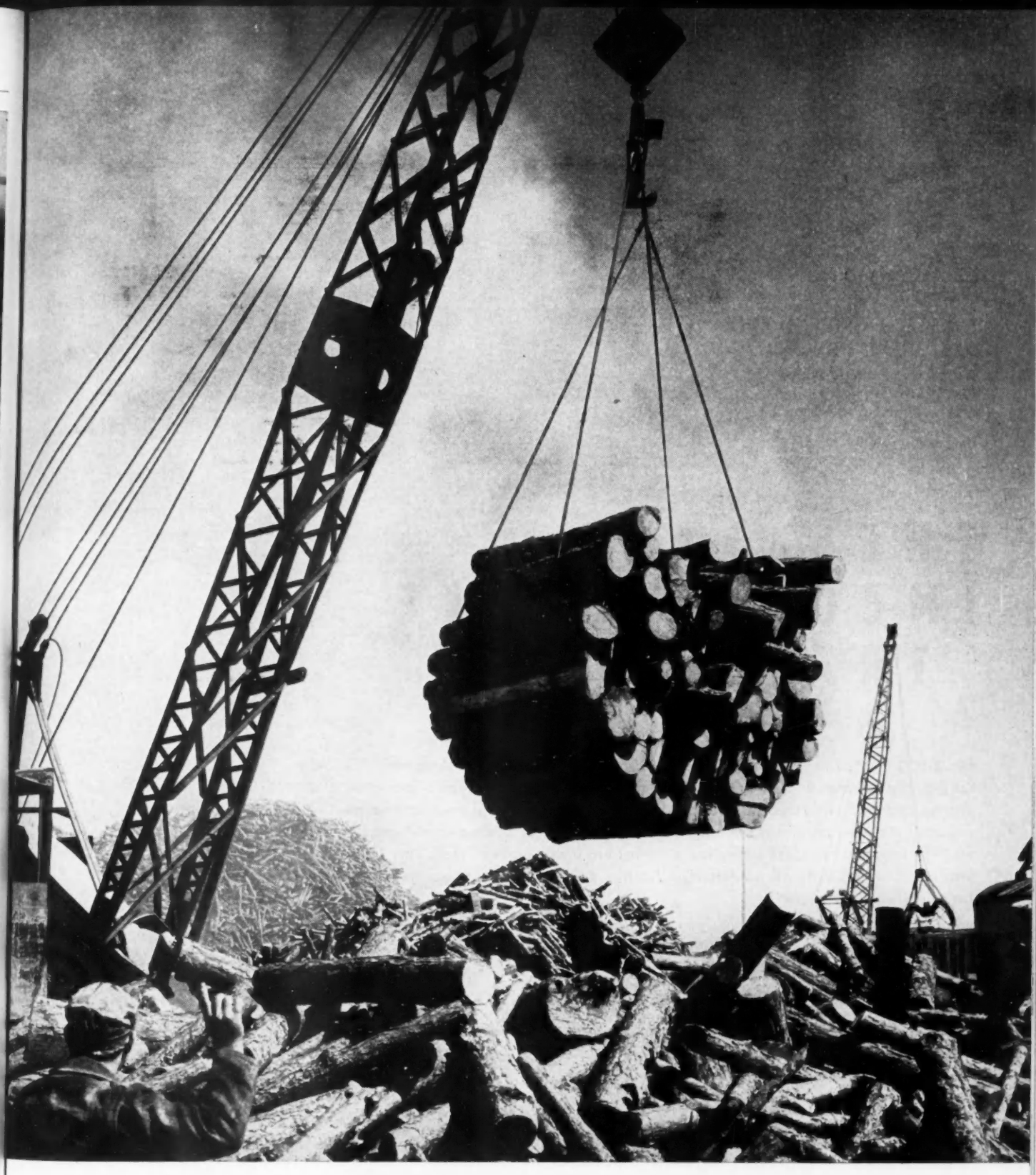
To change a suction line position so that material can be removed by the mud pump from the floor of the tank, or from any intermediate position from there to the surface, control the pipe by a hand winch installed on the frame of the vessel immediately above the swing fitting. Make the frame of the winch support of two-inch pipe with suitable cross members, and flat sheets of steel upon which the winch is mounted.

The winch is hand operated, containing a ratchet and pawl to maintain the desired position. Place the winch at the side of the stairway leading from the ground to the grated walk so the operator can operate the mechanism without walking a great distance after climbing to the top of the mud pump suction tank.



## Hauling Whipstock

Make a channel iron trailer and haul a whipstock from one location to another safely and easily. This is



**Wire Rope at Work** – This is the woodyard at Kraft Center, Cantonment, Fla., one of the largest enterprises of the St. Regis Paper Company. Here they build and move mountains – enormous mountains of logs. The stockpiles normally carry an inventory of 30,000 cords, and 1200 to 1400 cords are fed daily to the chippers at the paper mill.

The cranes you see in the yard are moving vast quantities of pulpwood, building up reserves so that the mill, with its healthy appetite for logs, will never go hungry. This is a job, too, for Bethlehem Wire Rope, which is rigged on the hard-working cranes. It is a punishing chore by any standard, the kind entrusted to Bethlehem rope in virtually every type of industry, wherever there's lifting or hauling to be done.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

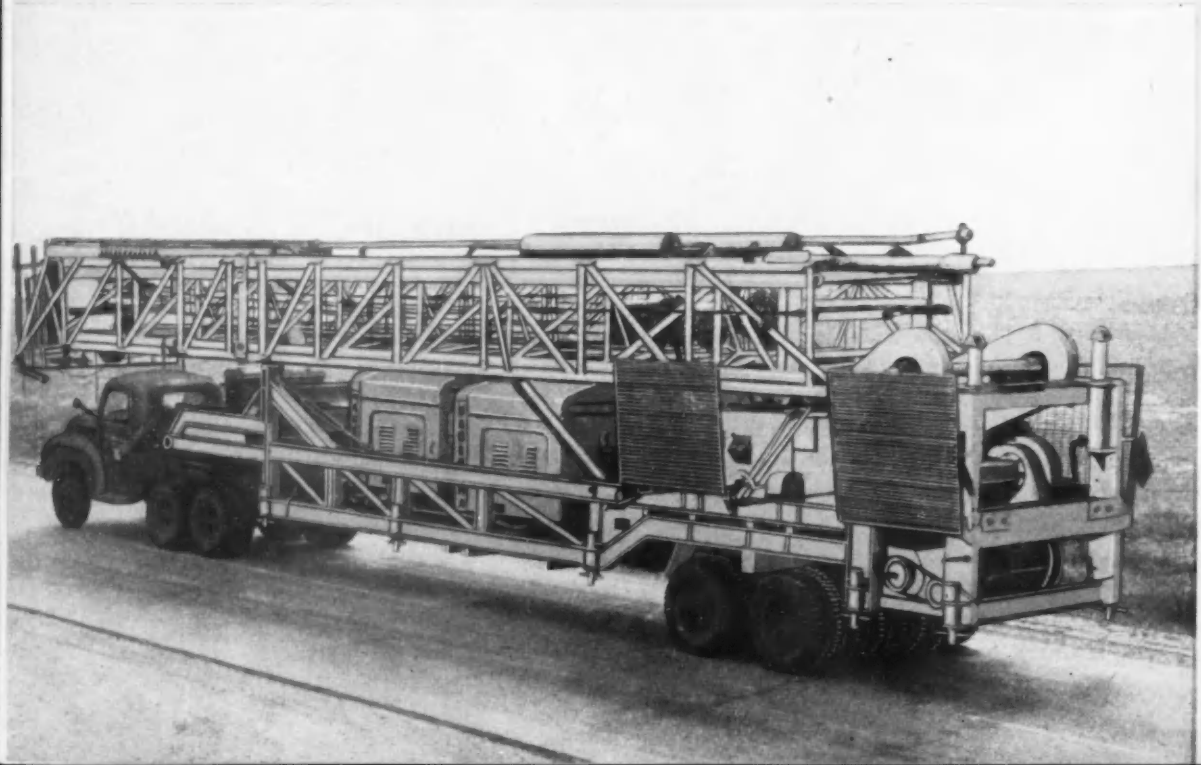
*Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:*

MINING • CONSTRUCTION • PETROLEUM • EXCAVATING • QUARRYING • LOGGING • MANUFACTURING

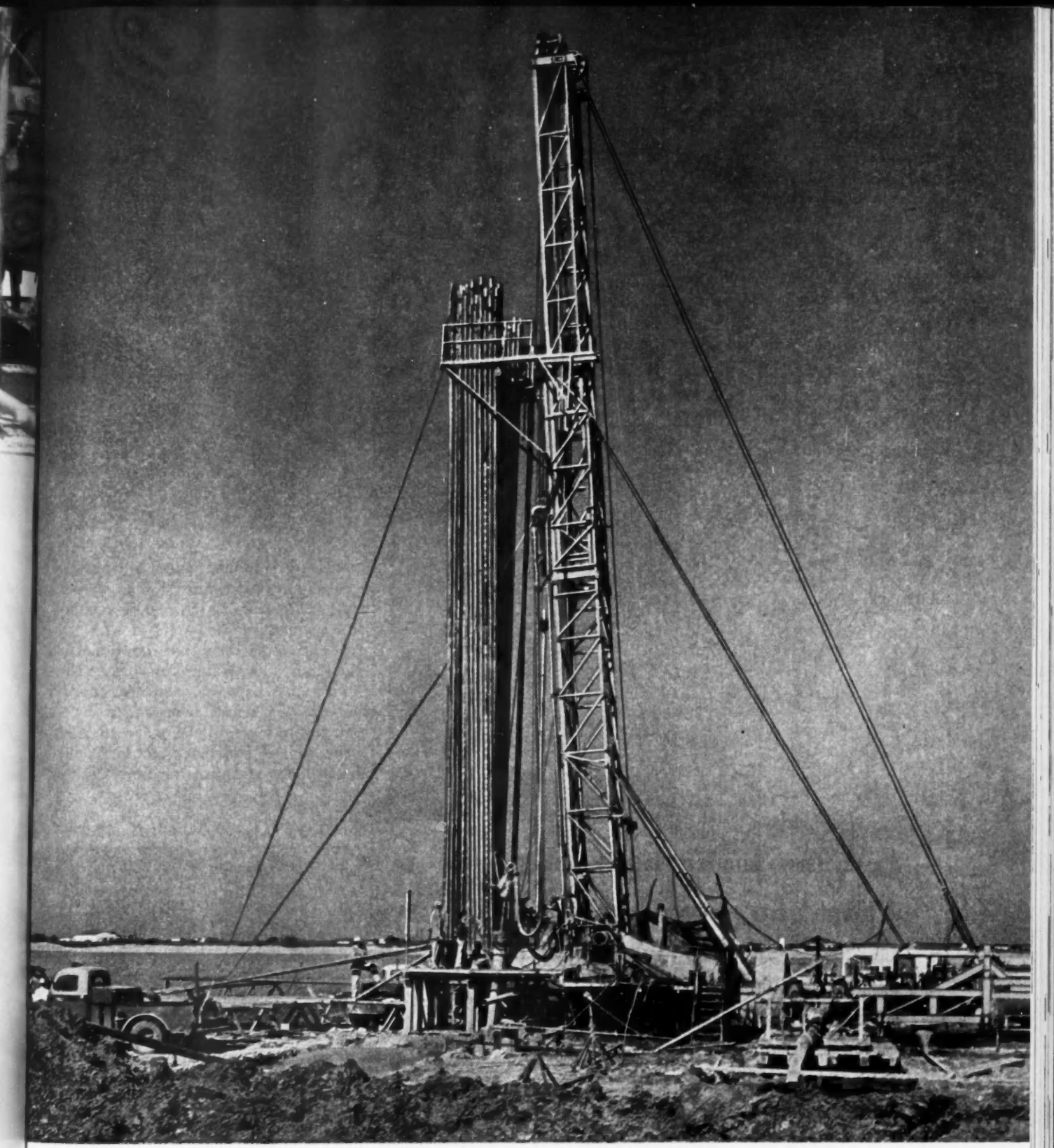
Ample space is provided for blowout preventers and wellhead connections.

# THE INCOMPARABLE "TRAILERIG"

**For 5,000-foot drilling with 4½-inch drill pipe and 10,000-foot workover jobs with tubing, the Cardwell "Trailerig" is in a class by itself. The 90- or 96-foot mast and twin-engine draw works are built into the trailer frame, making a compact, large-capacity rig with minimum moving and rig-up expense. During these times of high-cost moving jobs, this feature will save time and money on every well. The "Trailerig" is equipped with Cardwell air-friction clutches, famous for their exceptionally fast, trouble-free operation.**



In roading position, the "Trailerig" is only 8 feet wide, 13½ feet high and 59 feet long.



CARDWELL "TRAILERIG" WITH GM DIESEL ENGINES DRILLING 5,600 FEET WITH 4½-INCH DRILL PIPE IN SOUTH TEXAS

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THIS TRADE MARK INSURES HIGHEST QUALITY AT LOWEST PRICE

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Wichita, Kansas, U. S. A.

THERE IS A CARDWELL PARTS STOCK NEAR OR IN EVERY OIL FIELD OF THE WORLD.

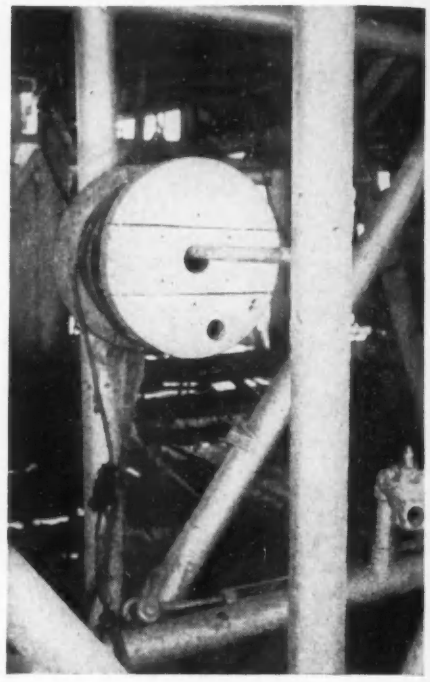
possible when facilities have been provided for the purpose.

This trailer has a channel iron frame enclosed with a floor to carry small tools and equipment. Upon this frame a long, open end trough is installed with practically the same inside diameter as the outside diameter of the whipstock so that this directional drilling tool can lie snugly in its cradle.

Two lugs, one on opposite sides of the trough are used as tie-downs for the whipstock so that it will not bounce out of its cradle when driven rapidly over unpaved oil field roads. With the conventional ball and socket hitch, the trailer can be pulled with a pick-up or oil field coupe.

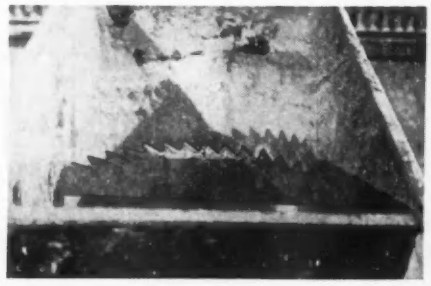
## Protecting Wire Line

The rigging line is considered important enough by Brown Drilling Company of Bakersfield, Calif., that they have installed a storage spool on Rig 6 so the wire line can be protected while the rig is being operated. A



cross piece welded between the vertical supporting members of the rig substructure supplies the spool mounting, which is permanent.

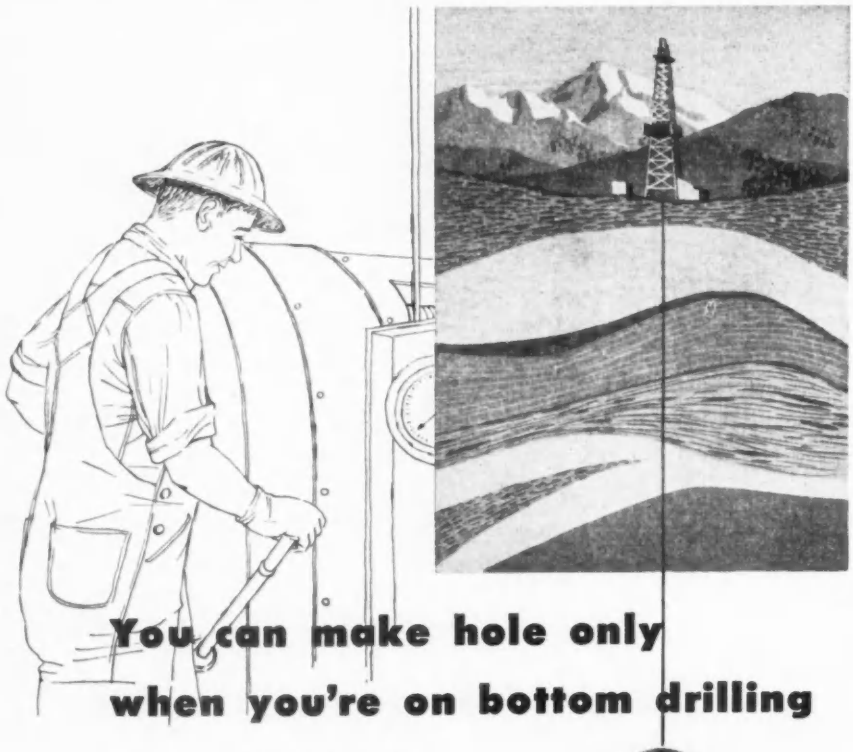
The spool may not be removed without cutting the cross piece. The wire line, however, is reeled on the spool when its use is no longer in demand. It can easily be reeled off after the well is completed, to lower the equipment when tearing down the rig.



## Splitting Bags

Weld a section of a coarse tooth crosscut saw to the sides inside of the mud hopper where the individual bags of dry material are opened for mixing with the circulation.

This device has replaced the vertical slitting knife formerly used after an injury had been sustained by a man cutting his hand. The saw slitter cuts the paper bags quickly so the contents may be emptied quickly without the operator exposing himself to the cutting edges.

**You can make hole only when you're on bottom drilling**

Every round trip costs money whether you're drilling at 3,000 feet or 20,000 feet. Isn't it logical then that the most economical drilling bit is that bit which makes more hole per bit — fewer round trips?

Diamond Drilling Bits

*by*

CHRISTENSEN
DIAMOND PRODUCTS COMPANY
1937 SOUTH SECOND WEST - SALT LAKE CITY, UTAH

**OUT OF THE VALLEY OF TEXAS:**

# A New Treasure For The Oil Industry

Magcobar has recently started producing the highest quality barite you can buy in this new plant at Brownsville, Texas . . . thus adding additional stocks of Magcobar Heavy Mud Weight to the oil industry's storehouse of high quality materials. Facilities at this deep water port insure prompt shipments to export markets and fast delivery to South Texas. These new Magcobar facilities are linked together in a chain with other Magcobar mining, manufacturing and service facilities that stretch from border-to-border, coast-to-coast. Wherever you operate, Magcobar's complete drilling mud service and ample stocks are available immediately. You can be sure of the quality . . . at fair and reasonable prices . . . when it's in the Magcobar bag.

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- JEL-OIL MUD
- JEL-OIL "E"
- "E" CONCENTRATE
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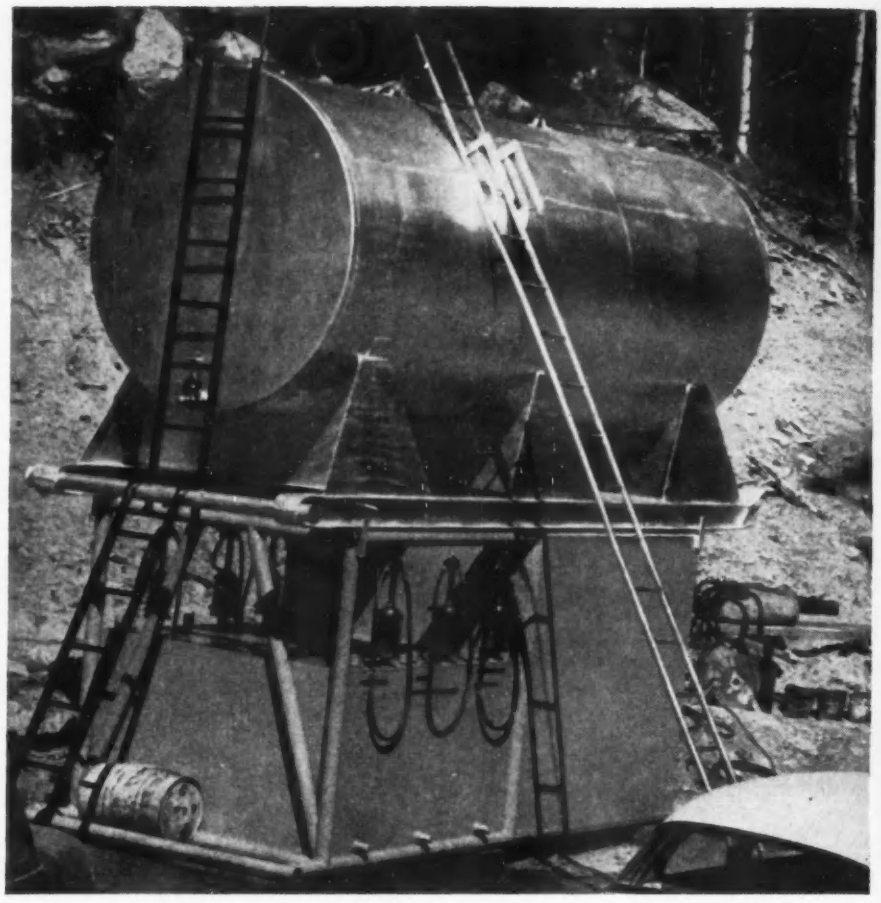
*Complete*
DRILLING MUD SERVICE
DEALER

HINTS . . .

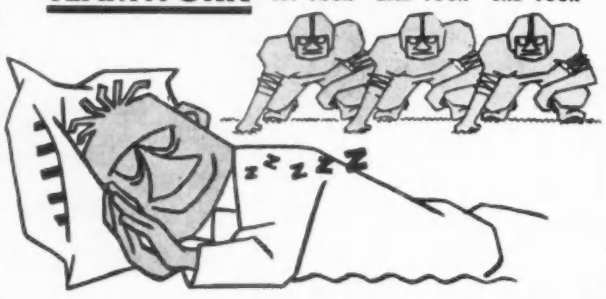
## Combining Fuel Tank

Make a unitized fuel oil storage tank, lube oil dispenser and toolhouse and save on transportation costs. Contractors using this assembly will be interested in the feature that it furnishes a base to elevate the fuel oil tanks so that fuel will flow by gravity to the engines.

This equipment was developed for use in the mountains where the transportation is always difficult. Notice that both the top and bottom sections of this assembly are skid-mounted for easy loading and unloading. The bottom section which contains the lube oil tanks, hand pumps and the toolhouse is made of light grade sheet metal installed in a frame made from two-inch pipe. Inside the toolhouse there are the usual racks and benches used for storing hand tools, so necessary in maintaining the rig. The upper section, which is the fuel oil tank, is mounted on a frame made from steel plate and I-beam as shown in the photo.




DON'T JUST DREAM ABOUT TEAMWORK




Give your crews the advantages of Geolograph's complete record of drilling operations . . . then watch 'em go for touchdowns! Geolograph just naturally inspires the kind of teamwork that gives you the most hole *at the least cost per foot!*

**GEOLOGRAPH**
MECHANICAL WELL LOGGING SERVICE
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Farmington, New Mex. • Liberal, Kan. • Oklahoma City, Okla. • Bakersfield, Cal. Abilene, Houston, Odessa, Lubbock and Wichita Falls, Tex. • Shreveport, and Baton Rouge, La. • Casper, Wyo. • Glendive, Mont. • Sterling, Colo. • Calgary and Edmonton, Alberta, Canada • Regina, Saskatchewan, Canada

KEEP YOUR MUD IN BALANCE with

"Mud-O-Graf"

- Provides accurate information for uniform mud control.
- Helps prevent blowouts by showing the duration and relative amount of gas in gassy streaks.
- Eliminates guess-work in the use of weighting materials, chemicals, and water.
- Indicates graphically all heavy and light streaks in the circulating system.

The condition of mud in the hole is recorded automatically during every minute of the drilling operations. Weight variations of less than 1/10-pound per gallon can be detected. Mud-O-Graf has been proved in twelve years tough field service. It eliminates trial and error methods of adding weighting materials. It detects gas or salt water incursions which could cause blowouts.

WARREN AUTOMATIC TOOL CO.
1920 HUSSION STREET, HOUSTON, TEXAS
*Manufacturers and Distributors of*
*Rig Runner and Pit-O-Graf*

● Drill rigs are skidded quickly, easily with this HD-15 doing the pulling. Positive Seals on truck wheels, idlers and support rollers give sure protection from dirt, grime and moisture — require lubrication only once every *1,000 hours!*

● This HD-15 with side boom is placing pipe for a pumping plant. Great stability of tractor permits booming way out — rack and counterweights are mounted high for maximum clearance on rough ground or in deep mud.

# Big Producers on Oil Operations

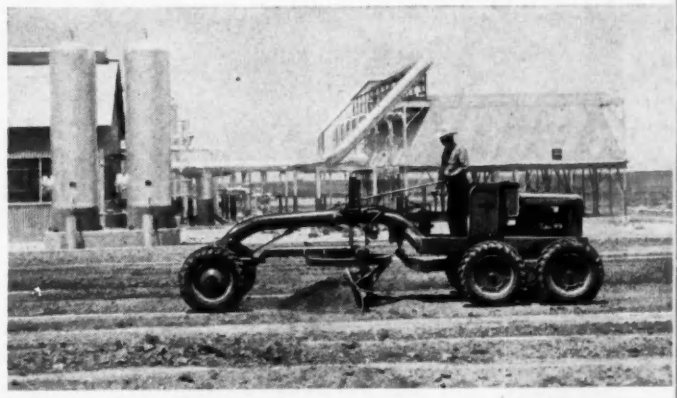
Allis-Chalmers complete range of earth-moving and materials handling equipment — all designed and introduced in the past few years — is logging big work output and low maintenance figures for drillers, producers and refiners alike.

Four powerful crawler tractors, 50 to 175 hp. — all built new from the ground up to take on any and all types of dirt and terrain — provide a weight and horsepower range to cover every oil field need. Among the four Allis-Chalmers tandem drive motor graders, 50 to 104 hp., you can be sure of exactly the right machine for your operations.

Matched, Allied units like the 9X no push-beam dozer and the heavy-duty side booms are setting new standards in the industry.

And behind all this equipment is a nation-wide dealer organization. Your Allis-Chalmers dealer has sales and service facilities that assure you of expert "after-sales" care and genuine factory-made parts. He will be happy to explain and demonstrate equipment to fit your needs. See him soon.

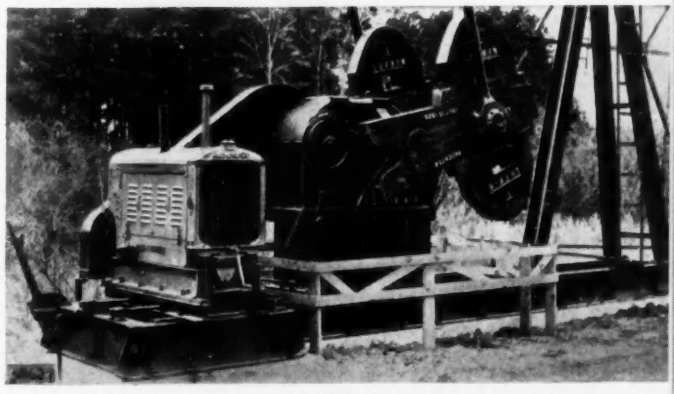
ALLIS-CHALMERS
TRACTOR DIVISION · MILWAUKEE 1, U. S. A.



● Low-cost maintenance at its level best — that's this Model D Motor Grader smoothing out grounds around a refinery.

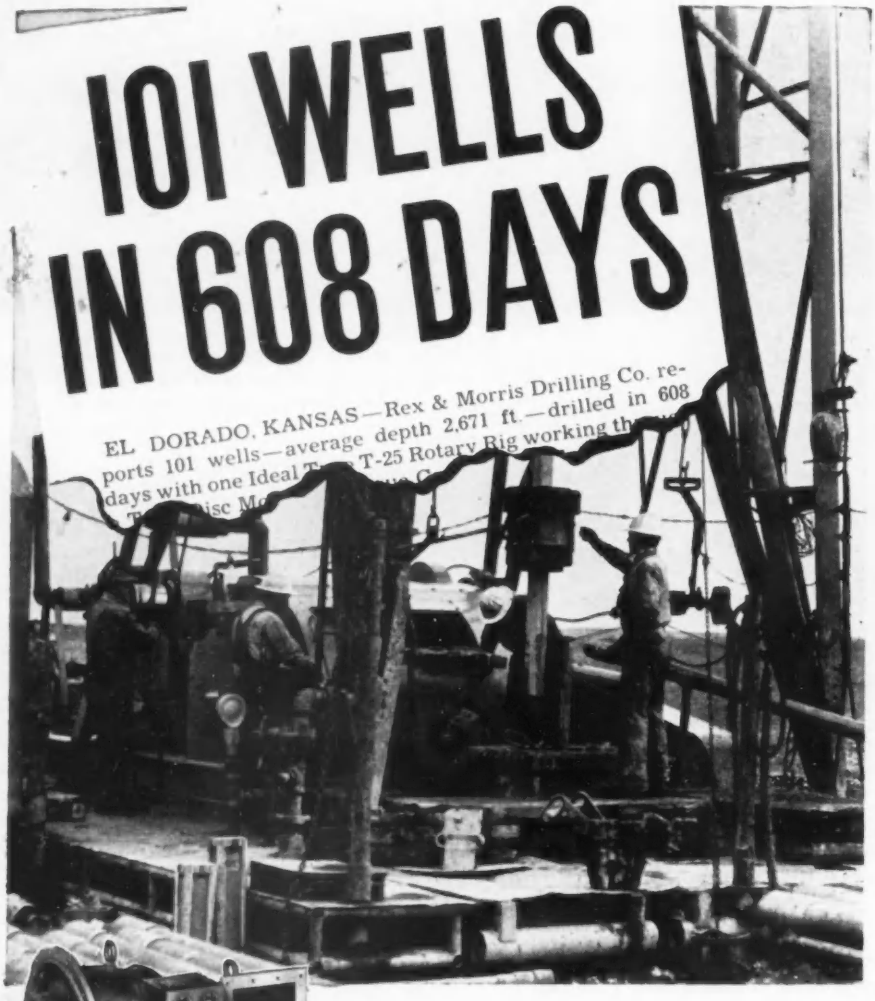
● Here an HD-5G with one-yd. Tractor Shovel loads gravel for road surfacing. Available for all four tractors, these loaders keep busy on dozens of jobs around lease and refinery.

● Slush pits are built deep, narrow — and in a hurry with this HD-9 Tractor with 9X no push-beam dozer. Blade is mounted directly on tractor main frame, providing steeper penetration angle.

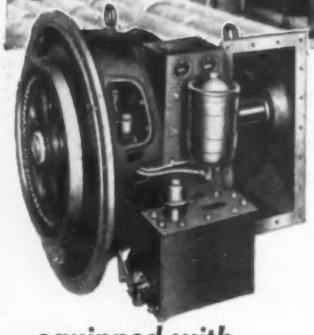


● It costs less to pump with Allis-Chalmers power units. Available in four sizes through Fred E. Cooper Inc., Allis-Chalmers power unit distributor to the oil industry.

# 101 WELLS IN 608 DAYS



EL DORADO, KANSAS—Rex & Morris Drilling Co. reports 101 wells—average depth 2,671 ft.—drilled in 608 days with one Ideal T-25 Rotary Rig working th



***equipped with Twin Disc Torque Converter***

Model IF Torque Converter on Ideal Rig boosts performance, protects equipment. Independent mounted. Model F (shown above) bolts to engine flywheel for "in-line" mounting. Write for Bulletin 135-D.

Rex & Morris Drilling Co. reports 101 wells—average depth 2,671 ft.—drilled in 608 days with one Ideal Type T-25 Rotary Rig working through a Twin Disc Model IF Torque Converter. All drilling was in hard-formation area in eastern Kansas. Rock bits were used every foot of the way. Original string of drill pipe was used for all 101 wells.

Such record performance is added *proof* that Twin Disc Torque Converters provide extra *boost* needed for *faster, steadier* and *more profitable drilling.* For complete information, write Twin Disc Hydraulic Division.

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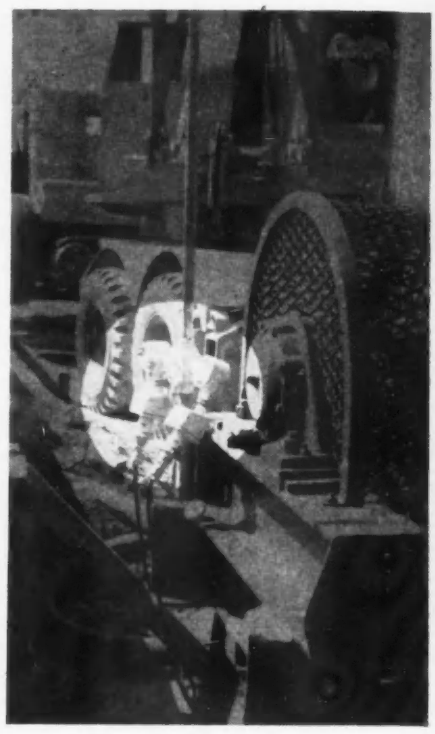


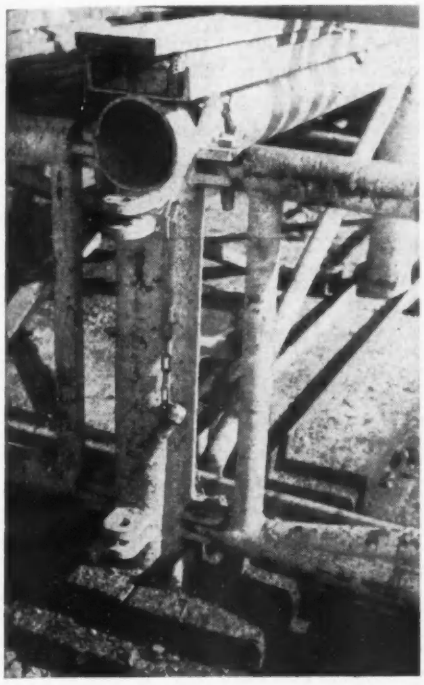
## Lighting Drilling Rig

Set lamp standards into sockets welded to the base of the equipment where illumination is required around a drilling rig. Affix standards with twin outlets or sockets so that the main service cord can be clipped into one or the other. Set cable into the other so that current can be carried to another lamp standard without running more than one main cable from the control panel. Each standard is a duplicate of others, all carrying two sockets so that no matter where a standard is needed, any of the several supplied with the rig can be used.

Where more than two standards are set at remote point from the generating plant control panel, all can be used by simply plugging in a connecting cable.

## Erecting Pipe Rack

When erecting a pipe rack on each side of the walk, the various sections can be attached to each other without the use of bolts or welded seams. On each side of the main sills, which ride upon channel iron as a base, are clevis type lugs so that wings of the rack can be installed by inserting sin-



gle lugs between the pair of lugs, forming the clevis, on the side rails. Tying the parts together is done with dowel pins secured near their operating position with chains. Similar clevises are attached to the vertical posts of the main sections to extend the rack to a size accommodating the requirements of the drilling well. All wings and panels have identical ends, and each panel is identical so that it can be set at any point without numbering or otherwise identifying separate panels.

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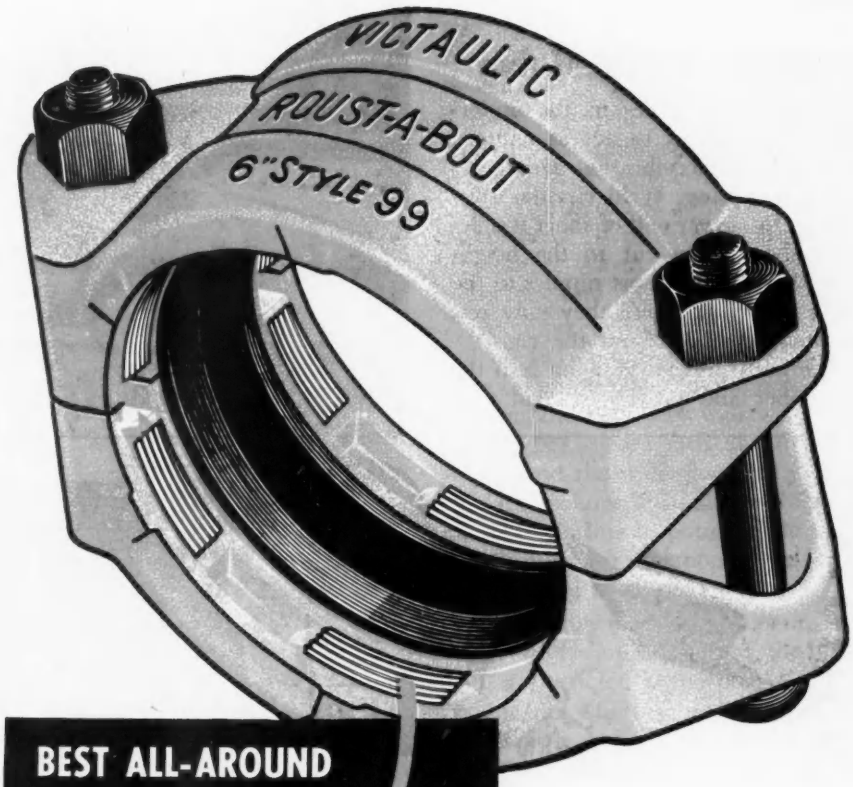
**The complete editorial index covering all issues of WORLD OIL published during 1953 is being prepared and is bound separately in convenient pamphlet form. It will be sent free to all subscribers who write requesting copies.**

**Orders should be addressed immediately to the Circulation Department, Box 2608, Houston 1, Texas, as quantities are limited.**


**BEST ALL-AROUND PLAIN END PIPE COUPLING ON THE MARKET!**

**HERE'S WHY...** *The Roust-A-Bout grips (teeth) take a strong, positive, circumferential bite on the pipe—as does a Tubing or Pipe Slip. The curved grips assure maximum gripping area for greatest holding power. This is the exclusive Roust-A-Bout, bull dog grip.*

Why accept less than the best when you are using plain end pipe couplings? Victaulic Roust-A-Bouts are specially engineered to provide the most reliable pipe connections you can use. With inclined, curved grips they bite into pipe circumference—provide a far stronger and surer hold.

Roust-A-Bout Couplings are just what the name implies—reliable, sturdy, adaptable and ingenious—ready for those tough field jobs where only plain end pipe is used or where the simple Victaulic Groove Method is not quickly available.

**Victaulic Roust-A-Bouts are quick and easy to install:...**

- You *cut* and *couple* your pipe as you go!
- You can use *plain* or *beveled end* pipe!
- You can use *new* or *used* pipe!
- For use on *permanent* piping or *repair* work!
- You need only one tool—a *socket wrench!*
- Roust-A-Bouts are simple and factory finished!

**For your next job—insist on the best**—Victaulic Roust-A-Bouts. They're available at all Victaulic Stocking Supply Houses in pipe sizes—2", 2½", 3", 3½", 4", 5", 6", and 8".

**Write today for the Victaulic Roust-A-Bout Catalog No. 44-81**

VICTAULIC COMPANY OF AMERICA • P. O. BOX 509 • **ELIZABETH, N. J.**

Office and Plant: 1100 Morris Ave., Union, N.J. • Telephone Elizabeth 4-2141
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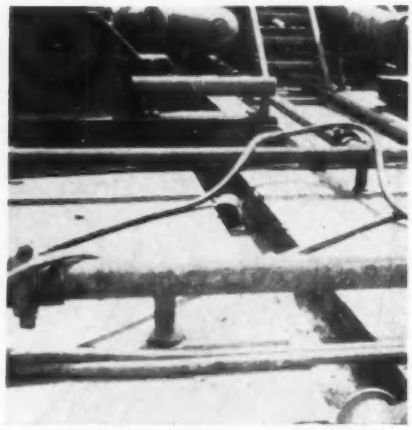
Export: Pipe Couplings, Inc., 30 Rockefeller Plaza, N. Y. 20, N. Y.

## Installing Dump Valve

Weld short nipples to the underside of mud lines to act as support pads and reduce vibration damage to hydraulic piping. Weld circular steel pads to the lower end of short nipples which have been cut to the height desired. Weld the short nipples to the joints at points where they may rest on timber mats around the rig.

The pads prevent gouging into the rig timber and provide a rigid support for the lines. Line vibration and shock are greatly reduced as a result.



Not only do the supports reduce shock, but also provide adequate space for men to make up the unions when running pipe from the manifold to jet lines or other points where mud under pressure is necessary.

"FLOLIGHT" RIG LIGHTS

VAPOR PROOF DERRICK LIGHTING EQUIPMENT FABRICATED TO FIT ALL SIZES AND TYPES OF DERRICKS AND MASTS

"IT'S QUICK TO RIG UP"

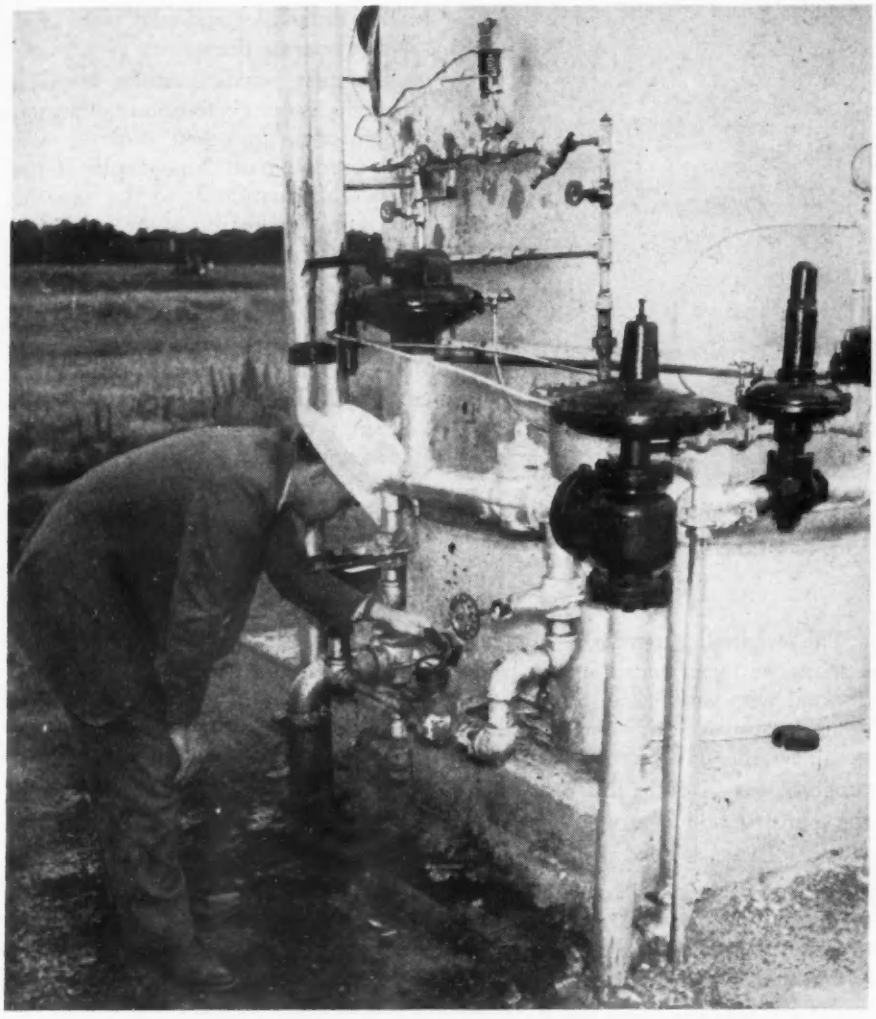
HUTCHISON MANUFACTURING COMPANY

6609 AVENUE U • HOUSTON 11, TEXAS

## It's Easy to Get Hurt!

**The Accident:** Employe discussed with driller the placing of pump on mud guns. The other pump was on hole. Employe went to the switchboard and engine house and made change without killing the board, resulting in a severe shock which burned his eyes and body.

**Recommendation:** A signal had been agreed upon by which the engineman was to notify the driller that a switch of pumps was to take place. The signal consists of a blast from an air horn whereby driller hoists the pipe off bottom. Second step in the procedure is to kill the board to make the necessary switches. After the switches are made the engineman notifies the driller by blowing the horn twice. This practice was not carried out, resulting in a knife switch being thrown in while hot. Safety procedures are useless unless followed to the letter.



**WASTE-WATER METER INSTALLATION** on a treater at one of the field batteries in Redwater field.

# Gravity Injection Pays Dividends at Redwater

**Designed to operate at minimum maintenance costs, this extensive layout ultimately will serve all 900 field wells.**

**By E. HOCHHAUSEN,** Manager, Redwater Water Disposal Co. Ltd.
and **I. M. RICE,** President, Rice Engineering & Operating Co.

A GRAVITY WASTE water disposal system that ultimately will serve all of the approximately 900 producing wells in the large Redwater field northeast of Edmonton, Alberta, recently has been put into operation.

Designed for operating with minimum maintenance cost, the system includes a network of 4-, 6- and 8-inch cement-asbestos type pipe gathering lines, accumulation pits and disposal wells, the latter being bottomed below the oil-water contact.

No serious operating difficulties have been encountered yet and it is believed that the field has been provided with a salt water disposal system that will give complete and low cost disposal until the field has been depleted.

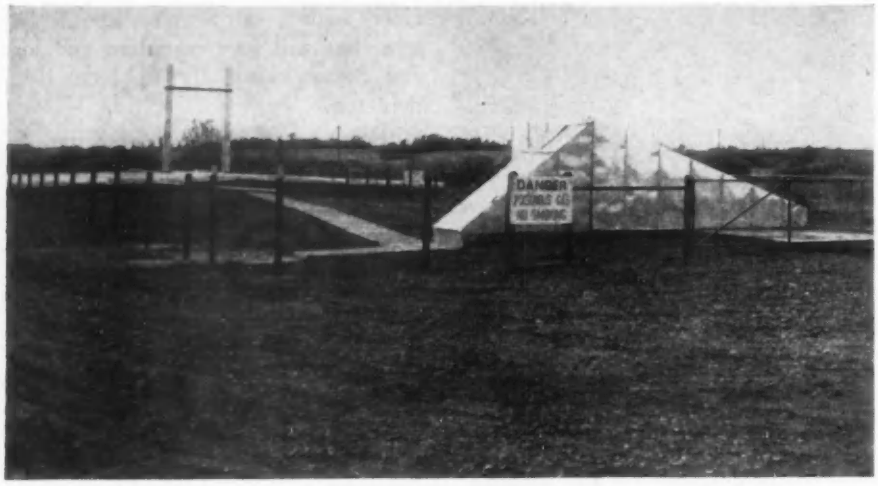
Redwater field was discovered by Imperial Oil Limited in 1948 when Imperial Redwater 1 in Lsd. 1 Sec. 32-57-21 was drilled. The field is situated about 30 miles northeast of Edmonton, Alberta, and is about 19 miles long and 3 miles wide.

Development was rapid and by the fall of 1951 approximately 900 wells were on production. Bottom hole pressure on the discovery well was 1050 pounds per square inch at 1165 feet subsea and the wells flowed. By 1950 the large volume of fluid removed had caused a decline in bottom hole pressure requiring installation of mechanical pumping equipment.

During the field development, reservoir study indicated that the field had a restricted water-drive. Water production was first encountered on the east edge of the field, where considerable vertical fracturing is evident. As the reservoir pressure declined and water production increased, operators foresaw the necessity for returning the salt water to the reservoir to assist in maintaining reservoir pressure and to avoid damage to surface water and vegetation.

The Conservation Board set up a system of water penalties whereby oil production from water producing wells was penalized when water production in excess of 2 percent was not returned to the formation. To dispose of salt water during the early stages of water production, two wells were made available for subsurface disposal to which water was hauled by tank truck. However, large volumes of water soon made this method of gathering water uneconomical.

An investigation was made of participation methods adopted for disposal systems in other areas, such as salt water disposal associations and independent corporations. After considerable study, it was decided to form a separate corporation, since no oil operator was willing to accept the responsibility for operating an association, no independent salt water operator was available at that time, and since it appeared desirable to have limited liability. It was, therefore, the decision of the majority of the operators to form a limited liability com-



**DISPOSAL SITE** at Redwater field. Pit, with vents atop plywood decking, is visible nearby. Disposal well cellar, foreground, is enclosed completely with plywood-aluminum covering.

pany, and this resulted in the incorporation of the Redwater Water Disposal Company Limited.

The Disposal Company is a joint stock company incorporated under the laws of Alberta Province. Members agreed to subscribe for two shares for each of their producing wells (with the exception of Imperial Oil Limited, which purchased only 45 percent of the total shares to avoid acquiring a controlling interest in the Disposal Company).

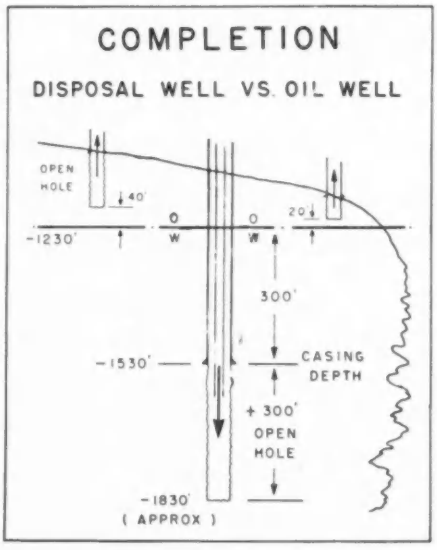
Shares were issued at $1 each. The shareholdings are important only as a means of determining the voting power of member companies. The company is governed by a board of 11 directors elected by shareholders. The company is being financed by the sale of non-interest bearing debentures to participating operators. Debentures are purchased on a per well basis as money is required for expansion.

The disposal company levies two monthly charges on participating operators: the depreciation charge and the operating charge.

Depreciation charge is levied against all wells in the field and is based on a ten-year amortization of the company's assets. The charge for water-producing wells is twice that for clean oil producing wells.

Operating charge is levied only against water-producing wells. This charge is precalculated quarterly and is divided equally among all water wells tendering water to the system, regardless of the amount of water produced from any one well. The company functions as a non-profit organization.

The original intention was to hire a manager experienced in salt water disposal who would acquire a staff to design, construct and operate the disposal system. However, since little progress was made in this respect and the construction season was getting short, it was decided to obtain the services of a consulting engineer who would act as temporary manager and to provide services of personnel borrowed from participating companies until a permanent operating organization could be established. During the period of construction in 1952, the borrowed personnel were replaced by permanent employes so that at the end of the construction season a permanent manager and staff were available to operate the system.




**CASING OF WASTE** water disposal wells is set 300 feet below field's normal oil-water contact, or at about 3500 feet, then stage-cemented to surface.

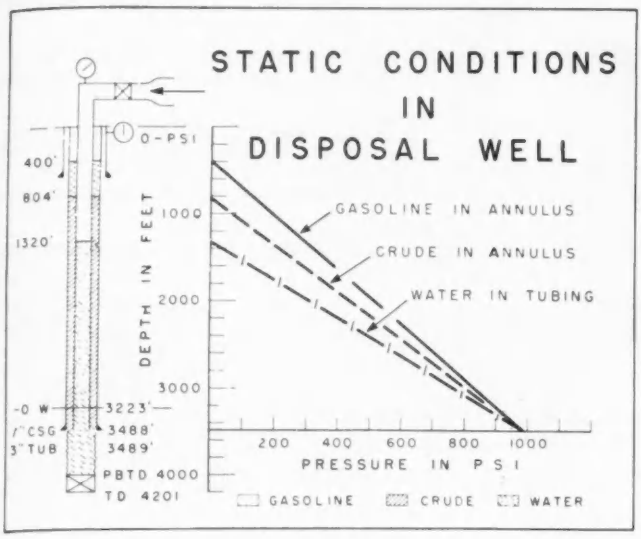
The first requirement in installing a gravity system is to obtain elevations of batteries, proposed disposal wells and predominant topographical features. Information as to the expected maximum quantity of water to be produced from each well must be obtained. After a preliminary design is completed, lines must be located, profiles drawn, hydraulic gradients plotted and line size and location adjusted to fit terrain conditions. Lines are designed according to the Hazen-Williams equation, using a "C" factor of 100 which experience has shown is the maximum that can be economically maintained over the life of the field.

Fittings are fabricated from cement-asbestos material and junctions are installed in accessible locations in such a manner as not to disturb the normal direction of flow. Lines are equipped to provide for cleaning with go-devils or line scrapers. Full opening valves are used throughout the gathering system. Hydraulic gradients are calculated on the basis of 200 barrels per well per day and extended from the top level of the accumulation pit at the disposal well to a point no higher than 200 feet above the ground level at any one treater. This is the approximate height of the siphon on a vertical treater and is equivalent to less than 10 psi on a horizontal treater.

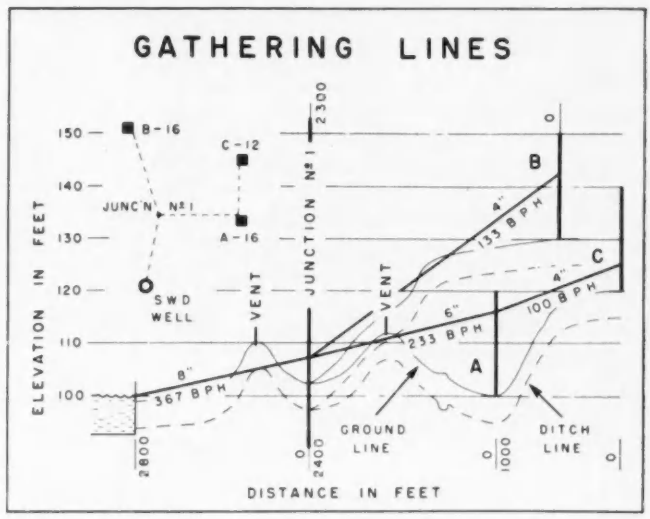
The 200 barrels per well per day basis was chosen to insure that oil production would not be penalized because of insufficient capacity of the disposal system. Gathering line capacities are in excess of probable disposal well capacities. However, lines are located so that the disposal facilities can be appreciably increased by drilling additional disposal wells.

The use of pressure treating equipment tends to introduce entrained and solution gas into the gathering lines. This gas breaks out of solution when pressure is reduced or temperature lowered and accumulates at the high points, necessitating the use of vents to prevent gas locks. An alternative method to prevent gas locks in the line is to install a gas boot, which is essentially a separator operating at atmospheric pressure, between the meter and the tie-in to the gathering line. Installation of approximately 50 boots during 1953 is expected to minimize gas and oil lock trouble.

Under normal conditions the ditch




**SALT WATER** corrosion of inside surface of casing and outside surface of tubing is prevented by loading annular space with column of light gravity oil.




**TYPICAL PLAN** and profile of waste water gathering lines in the Redwater field.

is excavated and pipe is bedded in accordance with manufacturer's specifications. Lines are encased in conduit at crossings of roads, railroads and creeks to prevent failure due to settling. Soil temperature surveys indicated that a 4½-foot cover is required to prevent freezing, except for road crossings, where the line is buried 7 feet because of deeper frost penetration. An analysis of the Redwater brine shows 100,000 parts per million dissolved solids. Specific gravity 1.07 and freezing temperature of 16° F.

It was necessary in some instances to lower the ditch depth to stay below the hydraulic gradient. Some of the system has been installed through muskeg with underlying quicksand, which necessitated deviating considerably from standard installation methods. In such cases the ditch was excavated with a backhoe, pipe was installed with the use of chain hoists, and no more than 15 minutes could elapse between excavating and backfilling to avoid uplifting of the quicksand and floating the pipe out of the ditch.

Pits at disposal wells were designed to handle fluctuations in the production rate, to reduce the velocity of the water so that suspended solids would settle more readily, and for the flotation of oil carried over from the treating equipment.

Pits and well cellars were constructed of reinforced concrete and were buried below ground level to prevent freezing and to obtain maximum head differential between batteries and disposal well. Forms for pits were of plywood and the plywood was then used to construct a deck as nearly vapor-proof as possible. Toxic gas from the pits is vented at a safe distance from the disposal unit. Fluid enters the pit through a perforated spreader which reverses the direction of flow. Fluid is withdrawn at the other end of the pit through a perforated spreader approximately 6 inches higher than the pit inlet.

From the pits, water is piped to the well cellar, metered and injected into the disposal well. A separate water line is run from the accumulation pit to a float boot in the well cellar. The float controls, by mechanical leverage, a ceramic-lined butterfly valve on the main from the pit. The valve closes before the fluid level in the pit will allow oil or air to enter the well tubing and completely opens before the fluid level in the accumulation pit reaches the overflow. The accumulation pit has an overflow through which oil may be skimmed and either picked up or burned at a burn pit.

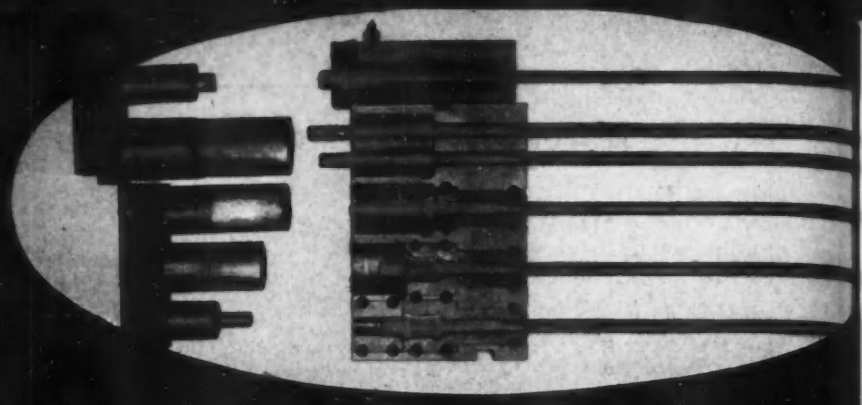
The focal point of the gathering system is the disposal well. The well is geologically situated in an area where it is considered that the formation will be most receptive to salt water injection. It is topographically situated in an area of low elevation and geographically situated at such a point as to serve a maximum number of batteries with the minimum size gravity lines and yet be within the limits of its injection capacity.

The existing disposal wells have been drilled with rotary equipment in the conventional manner. Surface casing is ten and three-quarter inch outside diameter set at 600 feet and cemented to surface. The oil string is seven inches O.D. set 300 feet below the oil-water interface or at about 3500 feet, and stage-cemented to the surface.

The stage method of cementing is used as a precautionary measure to prevent losing cement in the D-2 zone and to insure positive shut off of the gas bearing Cretaceous sands. Wells are drilled to the base of the D-3, or to a lesser depth if the formation characteristics appear good for water disposal. Logs are run and tests are conducted during the well completion to determine the reservoir characteristics. When total depth has been reached, the open hole is thoroughly cleaned and the formation is acidized. At this point, rotary equipment is moved off the hole.

Since salt water is corrosive, it is injected through a tubing string rather than through the seven-inch casing. Under static conditions, the fluid level is approximately 2200 feet of salt water. To protect the inside of the casing and the outside of the tubing from salt water corrosion, fluid in the annular space between the tubing and casing is displaced with an equal weight of light gravity oil.

The valve on the casing head is closed at static conditions and the gauge reading is zero psi. A decrease in injection rate, together with an in-



## 1. forging

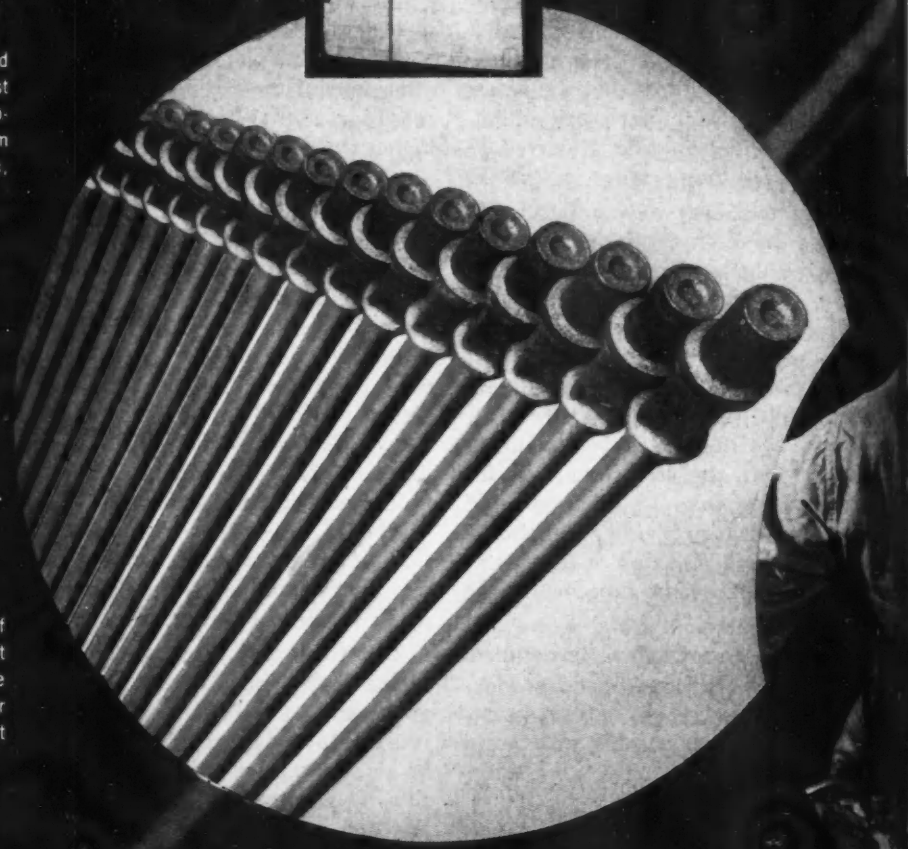
The length of stock gathered for the upset, in comparison with the diameter of the rod, makes the upsetting of sucker rod ends an extremely difficult operation. Rods are first preheated to 2250° F. Then, as this side view of the forge die blocks and punch holder shows, the various passes in the upsetting operation are made.

## 2a. control

Furnace chart on Salem rod normalizing furnace. This chart instantly records any temperature variation and permits complete control of heat throughout the furnace.

## 2. heat treating

After years of careful study Axelson has developed heating and cooling time cycles to produce the best mechanical properties. The carefully controlled production furnace insures uniform grain structure from end to end and the best combination of strength, ductility and shock resistance.



## 3. descaling

Group of forged rods after normalizing, tempering and shot blasting. Note uniformity, cleanliness, lack of surface defects. Removal of scale will reveal any rolling or forging defects. Rods are *rechecked* at this point for straightness.

## 4. threading

Axelson single spindle operation permits better control and supervision over each individual rod. In the final threading operation a self-opening die head (center foreground), especially designed for this work, is run on the pin, cutting the threads to the proper distance. An accurate lead screw controls the feeding of the die head onto the pin.

# *WHY* AXELSON SUCKER RODS LEAD THE FIELD

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Here are 4 of the specialized manufacturing steps which lead to Axelson sucker rod quality, a number of which are exclusive with Axelson.

*Send for Bulletin #5306*

***FIRST*** **. . . to use vanishing threads; to improve the curve of the upset ends into the body of the rod; to use nickel-molybdenum steel; to normalize and temper the rods throughout their entire length.**

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**NEWLY-LAID GATHERING LINE,** floating in water-filled ditch in muskeg area, illustrates problems encountered in laying of waste water system.

crease in casing pressure, would indicate formation plugging. A decrease in injection rate together with little change in casing pressure would indicate plugging or scaling of the injection string. A sudden decrease in casing pressure would indicate a hole in the injection string. Periodic checking of the flow rate and casing pressure gives a continuous record of the wells' condition and assists in forecasting the need for type of remedial work required. This method of installing disposal well tubing eliminates the need for a packer to protect against casing corrosion and the hazards attendant to its installation and removal. It also provides information not available with the use of packers.

Construction work has been carried on during both the 1952 and 1953 seasons. On August 18, 1952, intensive study of the design details for the system commenced. By September 6, 1952, construction permits were obtained, contracts let and construction commenced. By November 7, 1952, a total of 25.7 miles of 4 inch, 6 inch and 8 inch cement asbestos pipe line was installed, three disposal wells were available for water injection and lease equipment was installed to automatically control the flow of water in the wells. On this date, testing of the systems with salt water commenced.

Meanwhile, the Conservation Board had ruled that all water produced and injected must be measured separately. Meters were permitted if reasonable accuracy could be obtained. Accordingly, the Redwater Pool Producers Committee requested the disposal company to assume responsibility for metering all water in the field. Delay in obtaining the type of meter desired and necessary control equipment postponed the official starting date of operations to December 8, 1952.

## About the Authors

IVAN M. RICE is president of Rice Engineering & Operating, Inc., Chase, Kansas, a company which specializes in organizing, designing and operating salt water disposal and water injection systems. He was graduated in petroleum engineering at Tulsa University in 1940, and joined Gulf Oil Corporation's production department. In 1951 he resigned from Gulf to organize the present company. He was employed by the Redwater Water Disposal Company Limited in August 1952 as consulting engineer.

•

E. HOCHHAUSEN is manager of the Redwater Water Disposal Company Limited. He was graduated from the University of Alberta in 1947 with a B.S. degree in civil engineering. After graduation, he joined the staff of Imperial Oil Limited and spent a year and a half in the exploration department and three and a half years in the production department. He was appointed manager of the Redwater Water Disposal Company Limited in September 1952.

Immediately after 1952 construction was finished, a work program was prepared so that 1953 construction could start as soon as weather and ditching conditions permitted. Three more disposal wells were drilled and 37.3 miles of 4 inch, 6 inch and 8 inch cement asbestos pipe was installed. An exceptionally rainy season resulted in numerous difficulties and construction setbacks.

The disposal company is obligated to gather and dispose of all water tendered by the participating companies, either by truck or pipe line. The company is now prepared to accept water by pipe line from 68 batteries which serve 575 oil wells. Water will be hauled from two edge batteries. The gathering system will handle all water by gravity flow with the exception of two batteries from which water is being pumped with 1¼ inch electrically-driven centrifugal pumps.

During the first full month of operation, water production as metered at the individual batteries amounted to 121,300 barrels which was 6.8 percent of total fluid production. Six months later, water production amounted to 214,500 barrels which is 8.8 percent of total fluid produced in the field during July, 1953.

Total construction and material costs have not been accumulated but preliminary calculations show that costs can be divided roughly as follows: 20 percent to disposal wells, 10 percent to lease equipment and 70 percent to gathering lines, junctions, land and damages, and general engineering and overhead.

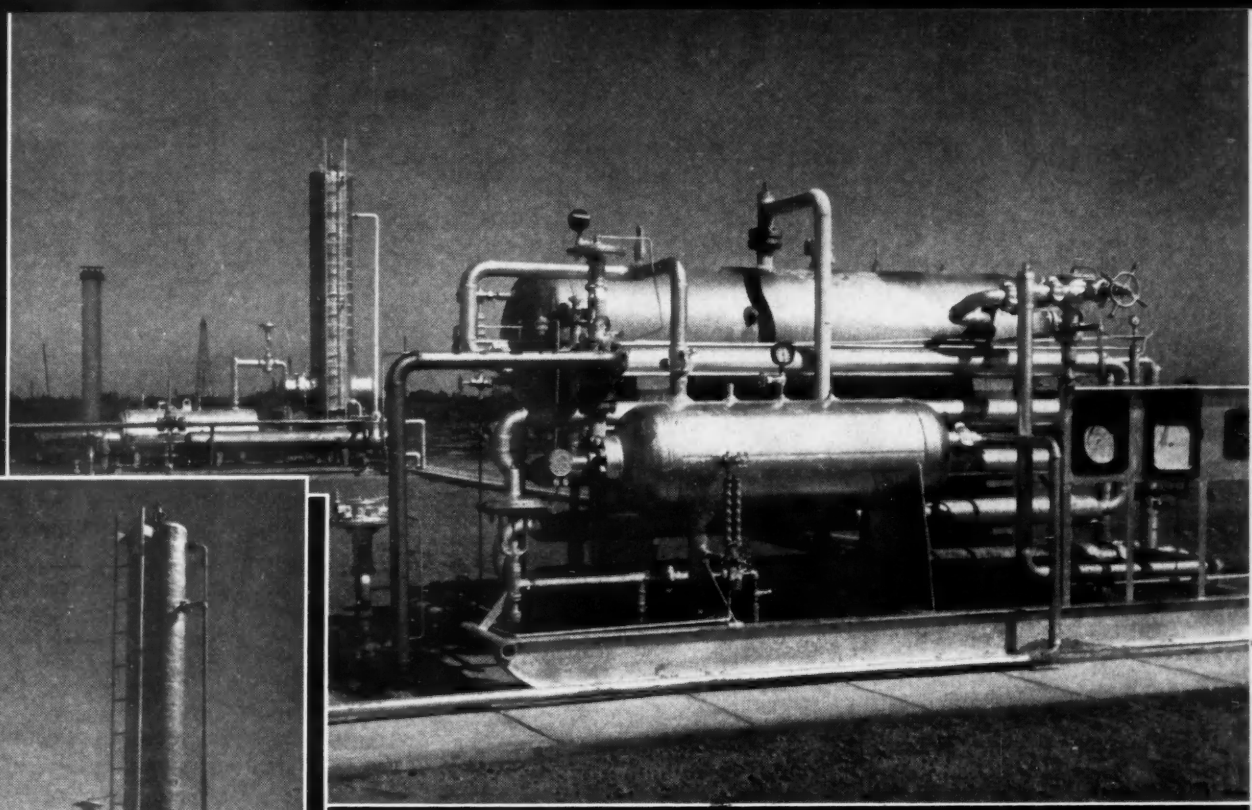
Methods and materials used in design of the system provide for a minimum of operating personnel and low operating and maintenance costs. Three of the company's ten full time employes handle all field supervision, maintenance of lines, wells, pits, the two pumps, and 65 meters. All planning, engineering construction, purchasing, land work and accounting is handled by the remaining personnel.

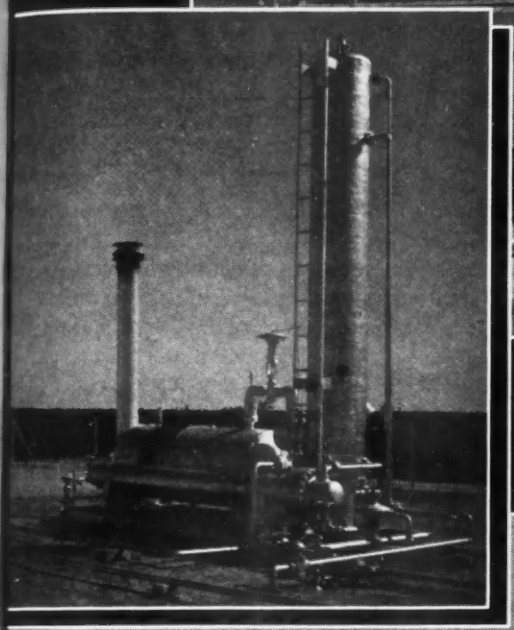
No serious operating difficulties have been encountered, and it is considered that the Redwater Field has been provided with a salt water disposal system that will give complete and low-cost water disposal until all producing wells have been depleted.

**—The End**

**ACKNOWLEDGMENT**

Article based on paper presented originally by authors at April 13-15, 1953, Annual General Meeting of Canadian Institute of Mining and Metallurgy, Edmonton, Alberta.





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# How to Select the Best Decline Curve

**• Reservoir behavior under secondary recovery can be predicted if the right type of curve is used.**

**• Here are some hints on the kind to use for accurate results, and on procedures to avoid.**

**By D. E. MENZIE,** Petroleum Engineering Department, University of Oklahoma, Norman, Okla.

How MUCH OIL will be recovered by a secondary recovery project, and how long will it take? Extrapolation of production decline curves is a popular tool used to answer these and other questions. It is not unusually difficult to extrapolate a straight line curve to predict future behavior of a secondary recovery project, provided the proper decline curve has been selected.

There are many different types of decline curves used for this purpose, and not all can be used with accurate results. There are limitations to each type, which limitations are quickly justified by so many variables encountered in petroleum reservoirs. The haphazard use of decline curves may result in erroneous conclusions.

Perhaps the most difficult phase of making use of decline curves is that of determining a relationship which is suitable for extrapolation. Not all types of mathematical equations can be used in decline curve work. Search for a type of equation or curve that does not approach a positive or negative value at infinite time, and use one that approaches zero production rate at infinite time. Methods of plotting which require shifting, correcting or rectifying production data may produce large errors when extrapolated for a useful length of time. Useful information can be obtained from various curves which can be plotted as straight lines. Curves of cumulative, ultimate cumulative, $\frac{P}{\triangle P}$, $\triangle\left(\frac{1}{P}\right)$ and log P may be very helpful. Production rate versus time when plotted on reciprocal paper may produce a very good method of obtaining decline curve extrapolations. Later life of actual production decline data will tend to give a better future extrapolation than use of too much data over a greater period of time.

**Factors to consider.** Not all types of curves or equations fit decline data. Oil production rates in secondary recovery which make up the data will gradually reduce as time passes, and tend toward zero after large units of time have elapsed. Data plotted as production rate versus time will appear in general as in Figure 1-A. At infinite time, P will be zero. Mathematical equations which produce curves such as (1), (2) and (3) in Figure 1-B are of little use in decline analysis. Curve (1) shows an increase in producing rates with increase in time. Production values predicted in curve (2) approach a definite rate at infinite time, and curve (3) indicates a rate that tends toward zero and then to negative values at infinite time. Obviously, these three equations could be used in decline work only for a short period of time, and would eventually lead to erroneous results when extrapolated. An important rule to consider when extending decline curves graphically or mathematically is: investigate production rate values at infinite time. A logical value at infinite time (approaching zero) should be obtained.

**Curve Shifting.** When rate versus time is not a straight line on certain types of plotting paper, a straight line can be produced by correcting rate or time data so that the curve is plotted on a different portion of the paper. This method is useful when semi-log or log-log paper is used. Such curves are useful only when time data are corrected, for time values are relative and can be shifted without introducing an error. If it is necessary to correct production data, an equation for the curve may change to one of the types shown in Figure 1-B to give a definite value at infinite time.

**Constant percentage decline.** When the percentage decline in production rates between equal intervals of time is the same, a plot of P (barrels per day), versus t (time), on semi-log paper becomes a straight line. Such a curve is shown in the upper center of Figure 2. Since the plot on semi-log paper is a straight line, mathematically, the $\frac{\triangle P}{P}$ values must be constant. $\triangle P$ is the difference between rates at two different times. Here's an example:

| Time, (Date) | Production Rate, bbls/day | P, bbls/day | $\frac{\triangle P}{P}$ |
|---|---|---|---|
| Dec. 1951 | 107.5 | | |
| Feb. 1952 | 88.0 | 19.5 | 0.22 |
| Mar. 1952 | 72.0 | 16 | 0.22 |

This plot is shown in the upper right corner of Figure 2. The reciprocal $\frac{\triangle P}{P}$ is plotted in this case for convenience. But, if $\frac{\triangle P}{P}$ is constant, so will be the reciprocal.

To predict future production rates,

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**LOOK FOR THE GREEN RODS**

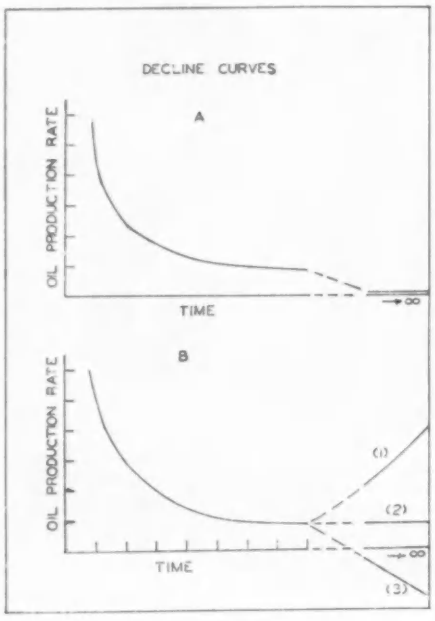



FIGURE 1

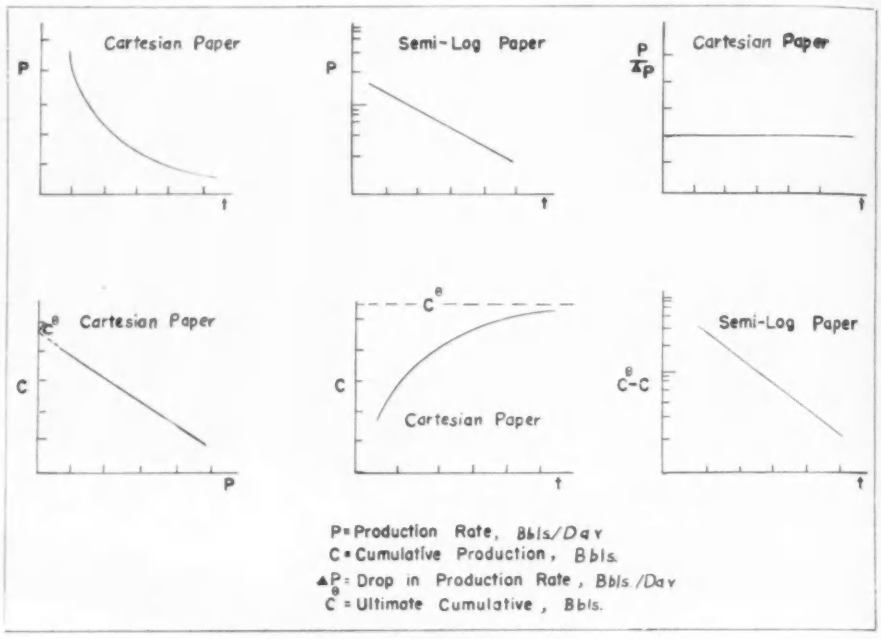



FIGURE 2

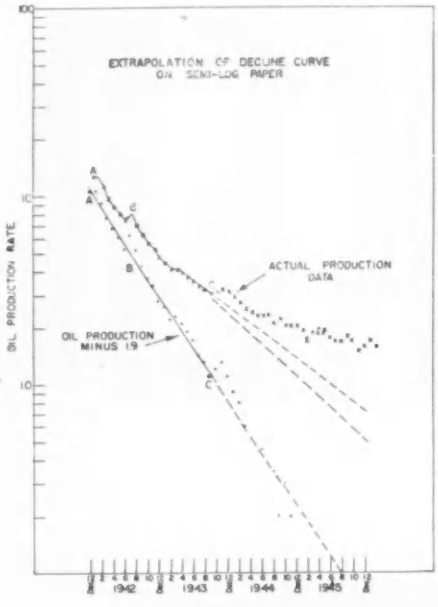



FIGURE 3

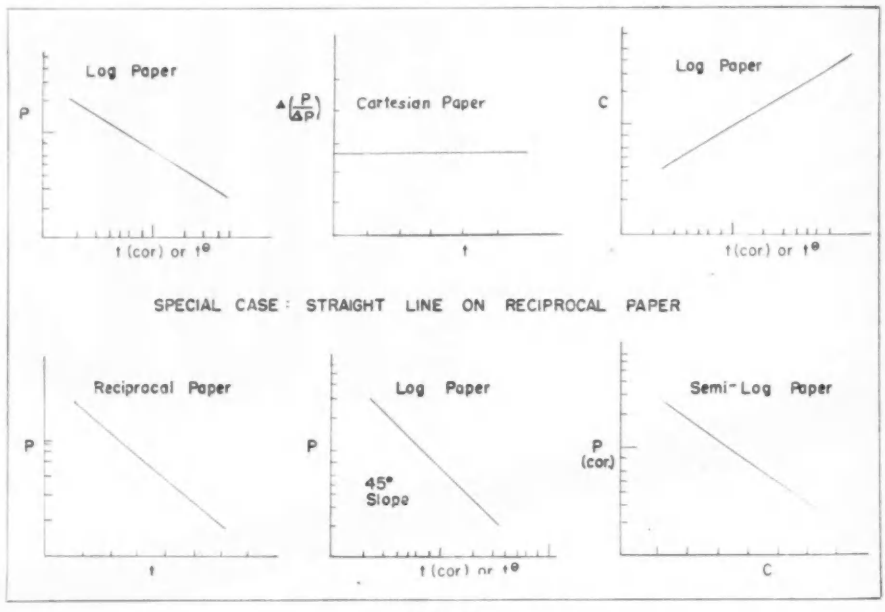



FIGURE 4

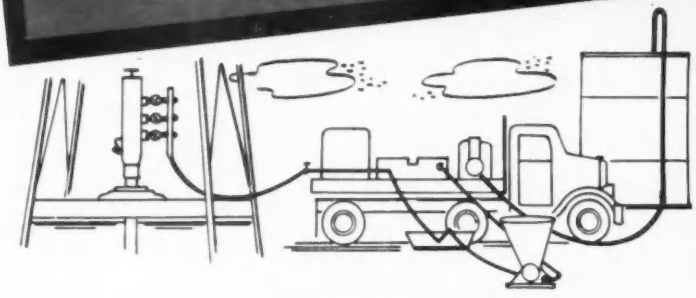
it is necessary only to establish a straight line on semi-log paper and extrapolate. Other types of curves also must follow if data plotted on semi-log paper forms a straight line. Cumulative production data in total barrels (C) for any given time plotted against rate must form a straight line on cartesian paper. This is illustrated in the lower left curve of Figure 2. Extrapolation to zero rate would give total cumulative ($C^{\Theta}$), or ultimate cumulative production. Note that ultimate cumulative total indicated by extrapolation is for infinite time. No consideration has been given the economic limit which forces shut down prior to infinite time.

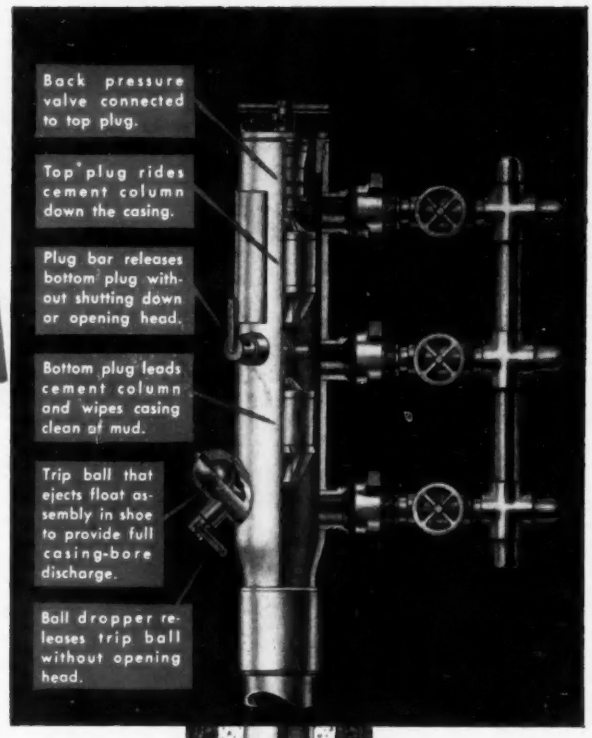
In the lower center curve of Figure 2, cumulative production versus time were plotted on cartesian paper, and must produce a curve as shown. This curve will approach ultimate cumulative value as time increases.

In the lower right corner of Figure 2 is a plot of the difference between ultimate cumulative minus cumulative ($C^{\Theta} - C$) versus time. On semi-log paper, this curve is a straight line. All six types of curves of Figure 2 must result mathematically when the P versus t is plotted on semi-log paper as a straight line.

Equation for "the straight line on semi-log paper" type curve is: $P = (ae)^{-bt}$, where a and b are constants. It is not necessary to know the equation of a decline curve in order to apply it. But to explain the process of skidding a curve, knowledge of the equation is helpful. If the P versus t plot on semi-log paper is

# From HEAD to SHOE




Back pressure valve connected to top plug.
Top plug rides cement column down the casing.
Plug bar releases bottom plug without shutting down or opening head.
Bottom plug leads cement column and wipes casing clean of mud.
Trip ball that ejects float assembly in shoe to provide full casing-bore discharge.
Ball dropper releases trip ball without opening head.

RECTOR FULBORE CEMENTING METHOD

## Prevents Contamination of Cement

**Hundreds of master cementing jobs by the Rector Fulbore Method prove the efficiency of its two plug method and the importance of its other exclusive features which are the basis of successful and satisfactory cementing jobs everytime. Ask your Rector Representative or authorized supply store for the complete story about better cementing with the Rector Fulbore Method.**

### PROTECTS AGAINST CONTAMINATION

The cement is completely and effectively segregated from well fluids by two closely fitting plugs which are positively and simply released at the proper time by mechanical means from outside the cementing head.

### CLOSED CIRCUIT

Cementing head is never opened from the time cementing operations begin until they are completed. It is impossible for air pockets to form in either the mud or cement column.

### FULL CASING DISCHARGE

Float assembly is pressure-ejected from the float shoe by the trip ball after casing string has been floated to position. This unrestricted opening reduces the load on the pumps . . . circulates greater volume with same pump pressure and results in higher velocity in space between casing and bottom of hole.

### POSITIVE FLOW-BACK

When the back pressure valve, which has traveled down with the top plug, latches in the stall collar, it positively prevents flow-back of cement. Operator may bleed the pressure back to zero and leave the well open or close it in at final runnjng pressure.

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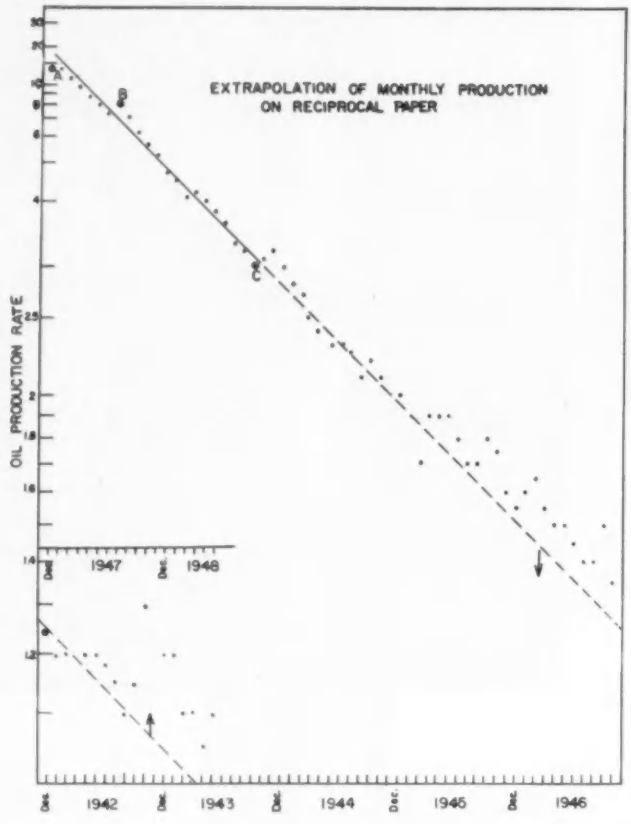



FIGURE 5

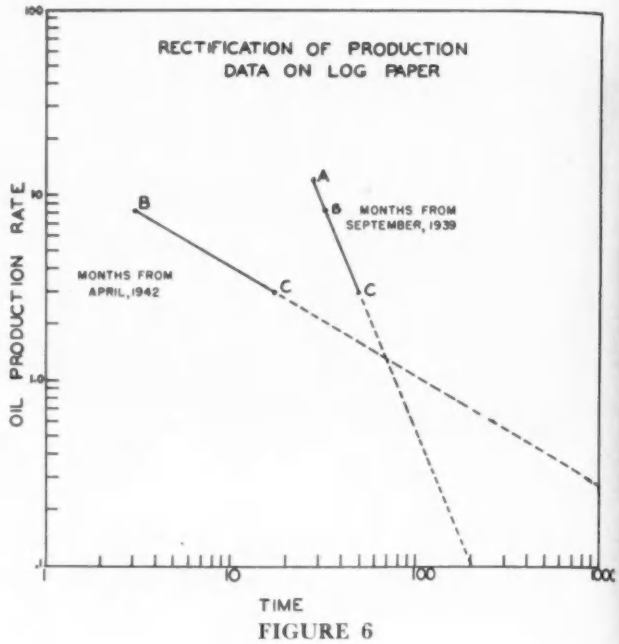



FIGURE 6

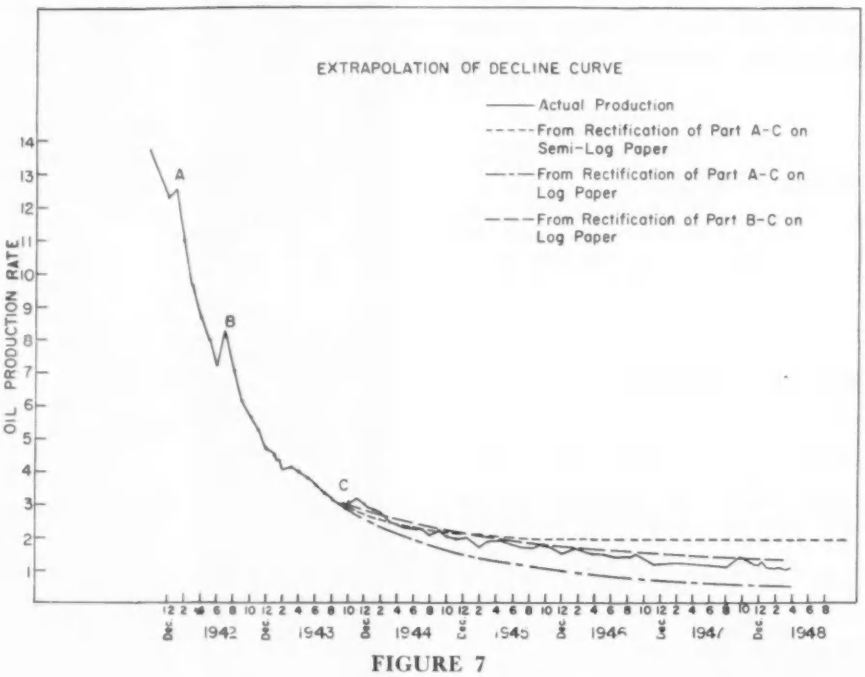



FIGURE 7

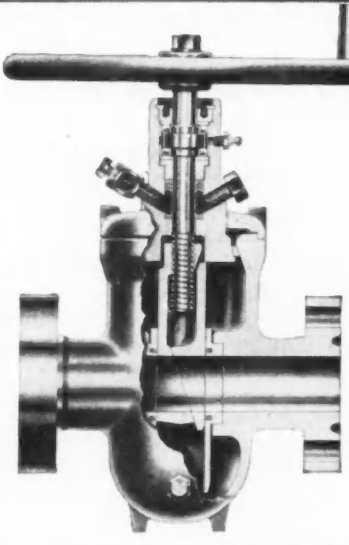
not a straight line, data can be corrected to produce one. Correcting production data from P to $P^{\theta}$ is done by adding or subtracting a constant to actual values.

Figure 3 is a plot on semi-log paper of actual production data on a water flood project in the Bradford field. Actual production data do not form a straight line. When production rates were corrected by a constant (—1.9), the curve was shifted to form a straight line which was extrapolated to indicate future oil production.

Equation for this curve is $P^{\theta} = (ae)^{-bt}$, where $P^{\theta}$ is the corrected production rate. Extrapolation was found to be in error with actual data because the curved tended to reach a value of 1.9 at infinite time instead of zero. This type of curve is useful only for a short period of time and is not valid over the entire producing life of a lease. The two dashed lines of Figure 3 are straight line extrapolations of a portion of the data before shifting. Comparison of these curves with subsequent actual data indicates that large errors may result. The error is large because these data do not form a straight line when plotted on semi-log paper, yet this extrapolation assumes a straight line. Shifting the time scale on such a plot would not straighten the curve, for time is plotted on the regular co-ordinate scale.

**Uniform decline of decline ratio.** When production rate versus time are plotted on log-log paper to form a straight line, the resulting curve is of the uniform decline of decline ratio type. This type curve is shown in the upper left of Figure 4. Because the curve is a straight line, the difference between two successive values of decline ratio are constant. This value is $\triangle \left(\frac{P}{\triangle P}\right)$ and is shown plotted against time in the upper center curve.

When cumulative production is plotted against time on log-log paper, a straight line relationship also must



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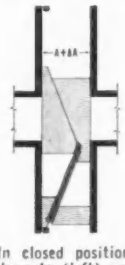
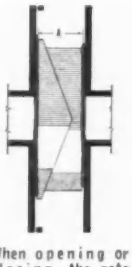
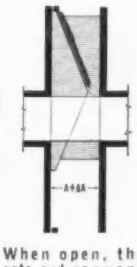


In closed position, the gate (left) and segment (right) seal tightly against both seats.



When opening or closing, the gate and segment are in neutral position permitting free upward or downward movement of the gate assembly.



When open, the gate and segment again seal tightly against both seats and the bore of each lines up perfectly with the bore of the body to provide a smooth, full-round conduit.

You can ***completely*** overhaul a W-K-M Valve right on the tree in one hour! When overhauled, the valve becomes as good as new, ready for many more years of efficient, trouble-free service.

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result, as shown in the upper right curve of Figure 4. Equation for this type curve can be written as $P = a(t^{\Theta})^{-b}$, where P is production rate and $t^{\Theta}$ is the skidded or corrected time to form a straight line; a and b are constants.

The lower part of Figure 4 illustrates a "special case" of this type decline curve. The straight line on log-log paper has a 45-degree slope, or the exponent b in the equation above is 1. The equation is $P = (at)^{-1}$. It plots to a straight line on reciprocal paper as shown in the lower left corner. The curve of corrected rate versus cumulative production in the lower right corner of Figure 4 shows a straight line on semi-log paper when rate is plotted on the log scale.

Figure 5 is actual production data from Figure 3 plotted on reciprocal paper. Actual production data follows the dashed straight line even to very low rates. Results indicate accurate extrapolations for this type decline curve. Other equations for curves of "straight line on log-log paper" may be expressed as:

## About the Author

D. E. MENZIE has been teaching petroleum engineering at the University of Oklahoma for three years. Prior to this, he spent five years as a research assistant on a Pennsylvania Grade Crude Oil Association research project on secondary recovery. He holds B.S. and M.S. degrees in petroleum engineering from Pennsylvania State College.

(1) $P\Theta = a(t^{\Theta})t^{-b}$

(2) $P\Theta = (at)^{-1}$ (Straight line on reciprocal paper if t is plotted on reciprocal scale.)

(3) $P\Theta = a(t^{\Theta})^{-1}$ (Straight line if both $P\Theta$ and $t^{\Theta}$ are plotted on reciprocal scales.)

Figure 6 is actual production data from Figure 3 plotted on log-log paper. Original data were corrected to give a straight line for that portion of the curve from A to C (Figure 3), and the curve extrapolated. To investigate the importance of each section of a decline curve, actual production data from B to C (Figure 3) were corrected to give a straight line on log-log paper (Figure 6). Difference between the two extrapolations and resulting predicted performance is due to the use of a different portion of actual production data.

Results of extrapolations of various types of curves plotted from actual production data are best shown on Figure 7 where production and time data are plotted on cartesian paper. The solid line is actual production data. In each case, only the information to point C or until September, 1943, was used for extrapolation.

Types of decline curves discussed thus far are summarized in Figure 7. The dashed curve shows results of straight line extrapolation on semi-log paper. The curve is above actual data and the longer the extrapolation is made, the greater the error. This curve tended to give a positive value of production at infinite time, and thus the curve tends toward a positive asymptote.

Rectification of parts A-C and B-C of the original production data on log-log paper shows somewhat better extrapolations. Extrapolation of the larger section of data resulted in a greater error than if only the later information of the decline curve was used. Extrapolation of decline data plotted on the reciprocal paper (Figure 5) fell almost on the actual production curve. These data could not be plotted on Figure 7 because of information already shown. Of the methods tried, results of decline curve extrapolation on reciprocal paper were found to be the most accurate.

**Unusual types.** One of these types should fit almost all cases of actual production data. Due to some variation in permeability, operation, pressure, etc., decline data may fall into one of the more unusual types of decline curves. Decline data may plot as a straight line on regular graph

■ CONTINUED ON PAGE 196

**TABLE I**
**Straight Line Decline Curves**

| No. | Plot | Type Paper | Mathematical Equation | Remarks | Other Straight Line Plots* |
|---|---|---|---|---|---|
| 1 | P vs t | Semi-log | $P = (ae)^{-bt}$ | Plot (P) on log scale | $\frac{P}{\Delta P}$ vs t; C vs P; $(C\Theta - C)$ vs t on semi-log paper. |
| 2 | $P\Theta$ vs t | Semi-log | $P\Theta = (ae)^{-bt}$ | Plot ($P\Theta$) on log scale, not a suitable asymptote. | |
| 3 | P vs $t\Theta$ | Log-paper | $P = a(t\Theta)^{-bt}$ | | $\Delta\left(\frac{P}{\Delta P}\right)$ vs t; C vs $t\Theta$ on log paper |
| 4 | $P\Theta$ vs $t\Theta$ | Log-paper | $P\Theta = a(t\Theta)^{-b}$ | Not a suitable asymptote. | |
| 5 | P vs t | Reciprocal paper | $P = a(t\Theta)^{-b}$ | Plot (P) on reciprocal scale. | $P\Theta$ vs C on semi-log paper. |
| 6 | $P\Theta$ vs t | Reciprocal paper | $P\Theta = a(t)^{-1}$ | Plot (t) on reciprocal scale, not a suitable asymptote. | |
| 7 | $P\Theta$ vs $t\Theta$ | Both reciprocal scales. | $P\Theta = a(t\Theta)^{-1}$ | Not a suitable asymptote. | |
| or | $\frac{1}{P\Theta}$ vs $\frac{1}{t\Theta}$ | Cartesian paper | $P\Theta = a(t\Theta)^{-1}$ | Not a suitable asymptote. | |
| 8 | P vs t | Cartesian paper | $P = a - bt$ | Not a suitable asymptote. | |
| 9 | $\Delta P$ vs t | Cartesian paper | $P = a \pm bt \pm ct^2$ | Not a suitable asymptote. | |
| 10 | $\Delta(\Delta P)$ vs t | Cartesian paper | $P = a \pm bt \pm ct^2 \pm dt^3$ | Not a suitable asymptote. | |
| 11 | $\Delta\left(\frac{1}{P}\right)$ vs t | Cartesian paper | $P = \frac{a}{t} + \frac{b}{t^2}$ | | |
| or | Pt vs $\frac{1}{t}$ | Cartesian paper | $P = \frac{a}{t} + \frac{b}{t^2}$ | | |
| or | Pt vs t | Reciprocal paper | $P = \frac{a}{t} + \frac{b}{t^2}$ | Plot (t) on reciprocal scale. | |
| 12 | Log $P\Theta$ vs t | Semi-log paper | Log $P\Theta = (ae)^{-bt}$ | Plot (log $P\Theta$) on log scale, Suitable asymptote if $P\Theta = P = 1$. | |
| 13 | Log $P\Theta$ vs $t\Theta$ | Log paper | Log $P\Theta = a(t\Theta)^{-b}$ | Suitable asymptote if $P\Theta = P = 1$. | |

* Use cartesian paper unless otherwise specified.

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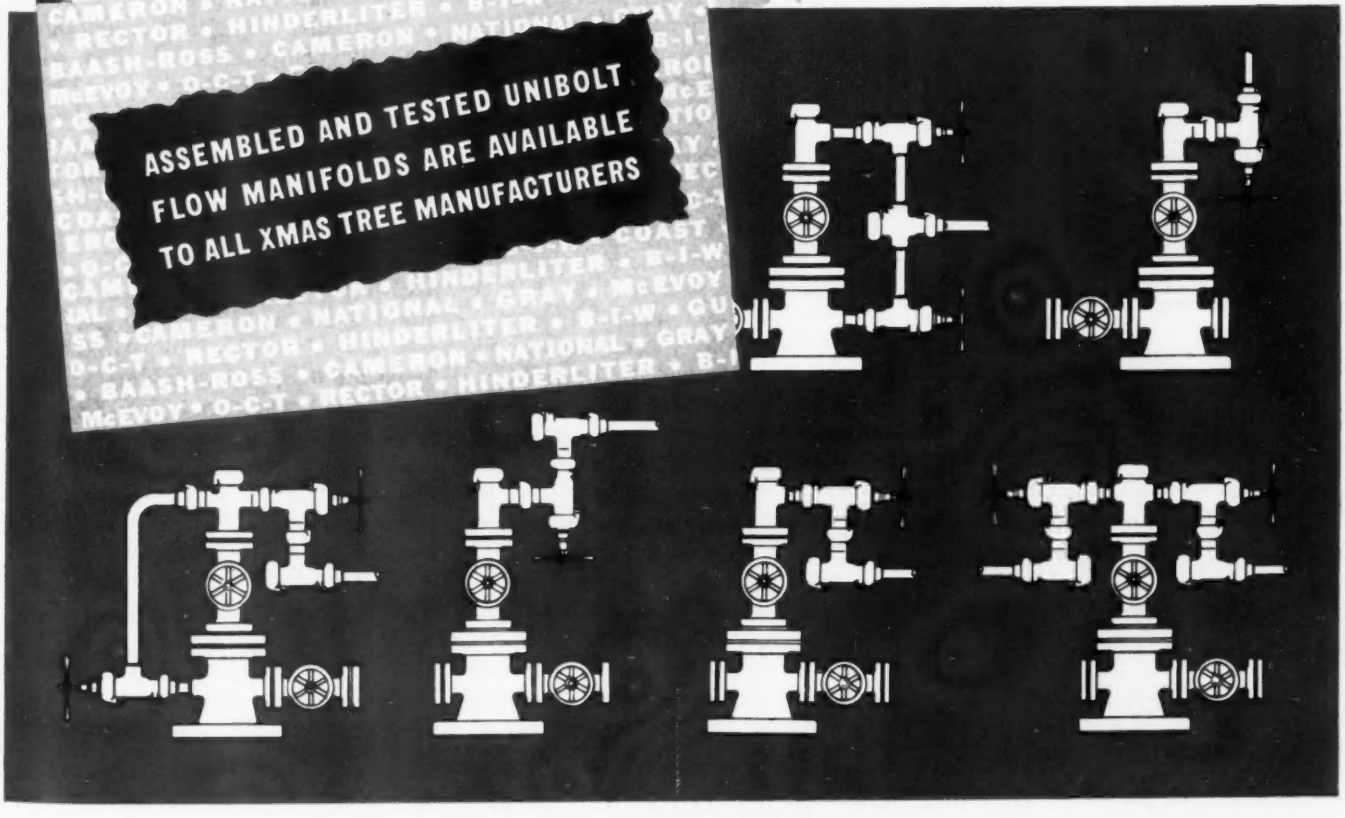

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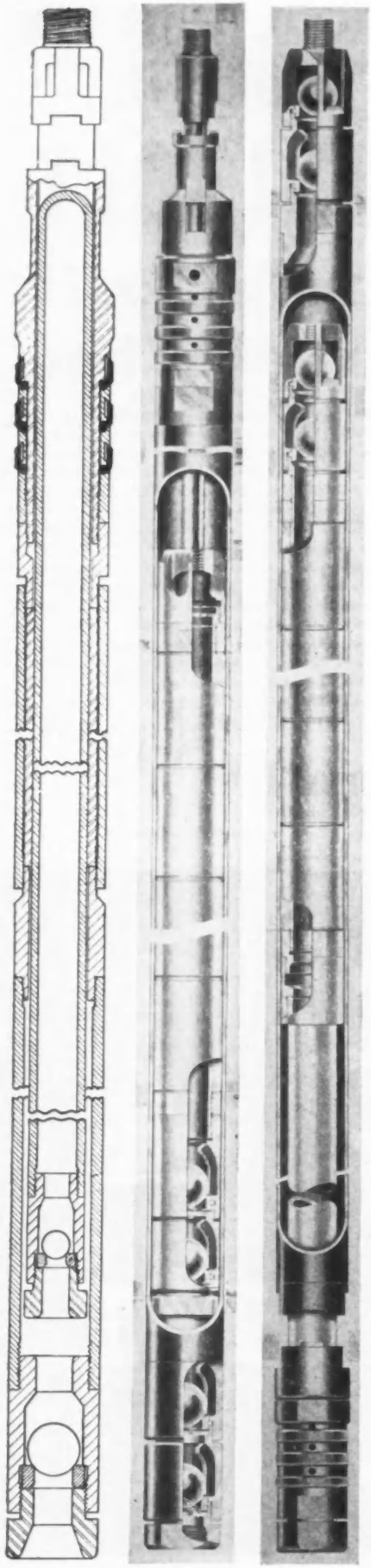

FIG. 1 FIG. 2 FIG. 3

Pumps with long plungers (Figure 1) operating in short liner columns have the lowest compression ratio and the least ability to displace gas. For maximum gas displacing ability, traveling valve on a tubing pump or stationary barrel rod pump should be located on the lower end of plunger (Figure 2). Standing valve on a traveling barrel pump should be located on the upper end of the plunger for maximum gas displacing ability (Figure 3).

**Efficiency of subsurface pumps can be increased by . . .**

# Proper Gas Control In Pumping Wells

**By KENNETH N. MILLS,** Chief Engineer, Walter O'Bannon Company, Tulsa

MOST COMMON cause for low pump efficiency in sucker rod pumping is gas. Free gas entering the space between the traveling and standing valves reduces the volumetric efficiency of the pump, and can cause the pump to stop producing fluid. Large volumes of free gas passing through the pump will interfere with normal valve action and reduce the volumetric efficiency of the pump. Liberation of gaseous vapors at the surface will reduce the apparent pump efficiency, because these vapors were liquids when they passed through the pump and pump displacement was required to lift them to the surface. As these vapors are liberated at the surface, they detract from the apparent pump efficiency.

Most common type of gas trouble encountered in oil wells is caused by moderate amounts of free gas being trapped between the traveling and standing valves. When the pump starts its down stroke, gas trapped inside the pump must be compressed to a pressure equivalent to that of the fluid column in the tubing before fluid can be transferred from the pump to the tubing. This condition results in the plungers traveling a portion of its stroke before oil is transferred to the tubing. The portion of the plunger travel spent traversing the space occupied by the gas represents an efficiency loss, because if this space were filled with oil, it would be doing useful work. For example, if half of the length of the plunger travel were filled with gas, the pump efficiency would be 50 percent. If the entire space between the valves is filled with gas and the pressure developed compressing this gas is less than tubing pressure, the traveling valve will not open to pass this gas out of the pump. Then the pump efficiency is zero, and the pump is gas locked.

**Pressure Drops.** Gas producing these losses can be free gas from the formation or gaseous vapors liberated by the oil. Quantity of gaseous vapors liberated by oil increases as the pressure imposed on the fluid is decreased. Consequently, troublesome gaseous vapors producing low pump efficiency are the result of pressure

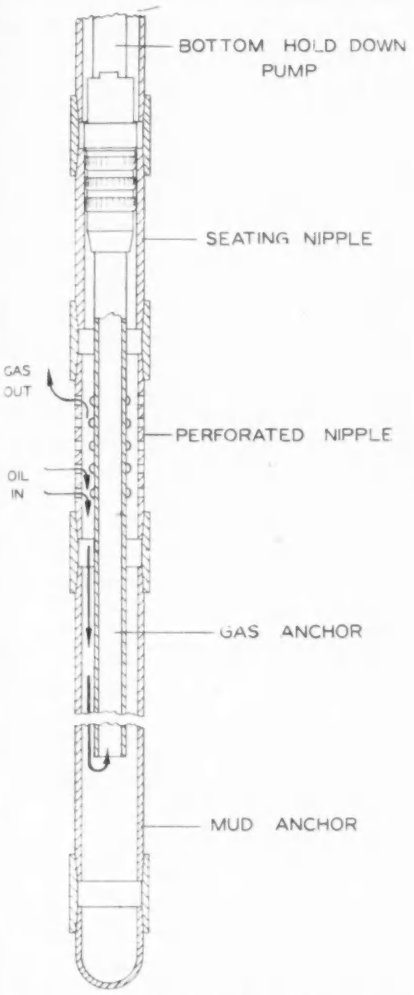


Fig. 4—Typical gas anchor design for a bottom hold-down pump.

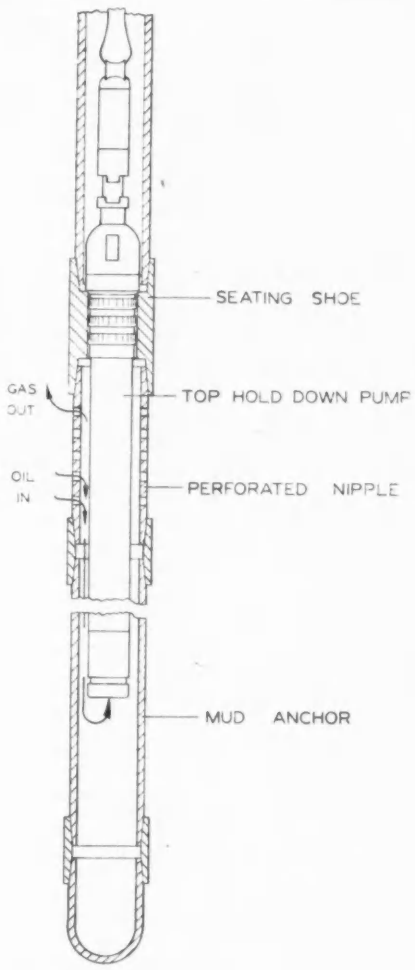


Fig. 5—Typical gas anchor design for a type hold-down pump.

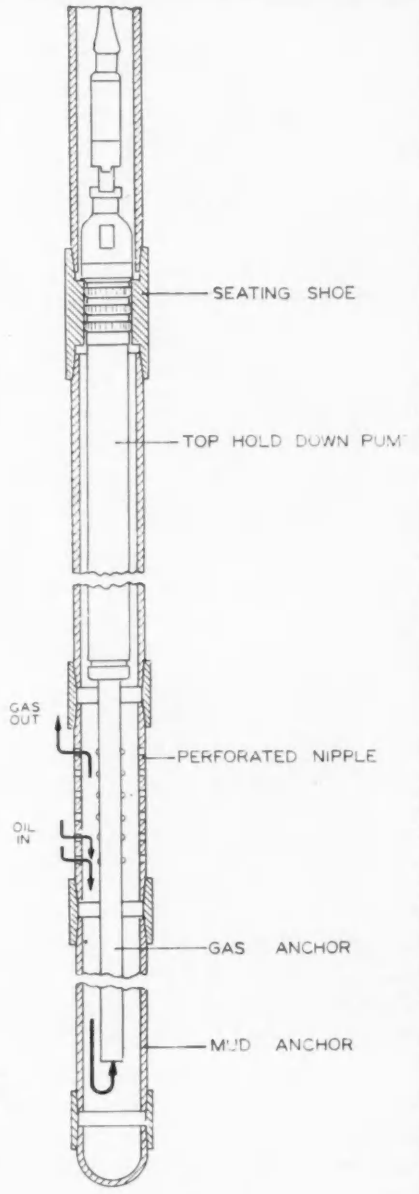


Fig. 6—Larger down-pass area is afforded by this type design gas anchor.

drops (losses) in the pumps suction system. These pressure drops occur in the gas anchor pipe, standing valve, and pull and plunger tubes of traveling barrel pumps. Obviously, decreasing these pressure drops or increasing the fluid pressure on the suction side of the pump will decrease the amount of gaseous vapors liberated inside of the pumps suction system. This would suggest setting the pump at the lowest practical position in the well to increase the fluid pressure on the suction and choosing a pump with a short suction system.

**Compression Ratio.** Ability of a pump to displace gas is a function of its compression ratio, and increases as this ratio is increased. The compression ratio is the ratio of the volume of space between traveling and standing valves at the top of the stroke to the volume between valves at the lower end of the stroke. Obviously, this ratio increases as the pump stroke length is increased, and the space between the traveling and standing valves is decreased. Also, it increases as the pump bore size is increased. Consequently, difficulties with gas lock can be materially reduced or eliminated by increasing the stroke length or increasing the pump bore size and decreasing the pumping speed to maintain production rates.

The compression ratio of a pump is also influenced by its basic design and relative location of valves. As decreasing the volume of the space between the valves on the lower end of the stroke increases the compression ratio, the pump design should be selected for low volume at this point in the stroke cycle. The minimum volume with the plunger in this position will be attained with a short plunger operating in a full barrel pump without extension nipples. Use of extension nipples to permit the plunger to stroke out of the barrel will increase this volume and slightly decrease the ability of the pump to handle gas. Pumps which have long plungers operating in a short liner column as shown in Figure 1 have the lowest compression ratio and the lowest ability to displace gas.

The relative location of standing and traveling valves will determine the compression ratio of a given pump. For maximum gas displacing

ability, the traveling valve on a tubing pump or stationary barrel rod pump should be located on the lower end of the plunger as shown in Figure 2. The standing valve on a traveling barrel pump should be located on the upper end of the plunger as shown in Figure 3. If a stationary barrel pump is double valved, both plunger valves should be located on one end of the plunger as shown in Figure 2. If one valve is located on the upper end of the plunger and one on the lower end, gas can accumulate in the space between the valves and decrease the ability of the pump to break a gas lock.

**Reducing Pressure Drops.** As previously mentioned, pressure losses in the pumps suction system can cause gaseous vapors to be liberated and enter the pump. These suction pressure losses can be reduced to a minimum by selecting a pump with a short suction system, using a large relatively short gas anchor and producing at low rates.

The minimum length suction system is found on stationary barrel pumps, and it is composed of only the standing valve. The maximum length suction system is found on traveling barrel pumps, and it consists of the standing valve, the plunger tube and the pull tube. Consequently, the pressure losses in its suction system are several times greater than that of the stationary barrel pump. The importance of using a large, short gas anchor was illustrated by Chenault[3] who developed the pressure drop values shown in Table I for various gas anchors. Data shown in this table is based on pumping an oil with a viscosity of 100 centipose with a 1¾-inch bore pump operating at 20—54-inch strokes per minute.

From this data it is apparent that a large diameter, short length gas anchor is desirable because it imposes less pressure drop, and therefore, has a minimum tendency to liberate gas. Length of a small gas anchor is particularly important in a low fluid level well, because the friction losses in the gas anchor will add to the suction lift. This can cause under filling of the pump in addition to liberating gas. If this occurs, the volumetric efficiency of the pump will be low and under extreme conditions will be zero.

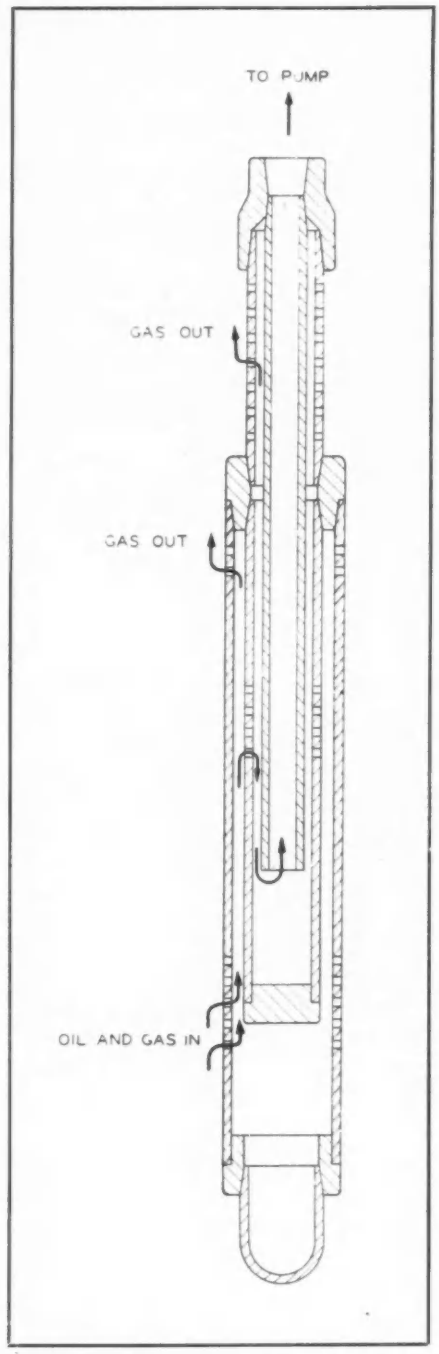


**Fig. 7**—Specially designed gas anchor using three concentric tubes with fluid passages that create agitation to consolidate gas bubbles.

**TABLE I**

| GAS ANCHOR | | Pressure Drop in Gas Anchor Pounds Per Square Inch |
|---|---|---|
| Pipe Size | Length Feet | |
| ¾ | 10 | 21.2 |
| ¾ | 20 | 42.4 |
| 1¼ | 10 | 2.3 |
| 1¼ | 20 | 4.1 |

**Gas Anchors.** Basically, a gas anchor is an oil-gas separator employing agitation and gravity to make the separation. Agitation of the fluid entering the gas anchor helps break the surface tension of the oil surrounding the smaller gas bubbles and permits them to join and form larger bubbles. Gas will tend to rise in the oil and pass out of the gas anchor, and up to the surface through the casing annulus. This tendency for the gas to rise in the oil is opposed by the downward velocity of the oil in the space between the mud anchor and the gas anchor pipe. If the absolute upward velocity of gas is greater than the downward velocity of the well fluid, gas will pass out of the gas anchor into the casing annulus. If the downward velocity of the fluid is greater it will be drawn into the pump.

The speed with which gas will pass through the fluid is a function of gas bubble size and the physical properties of the well fluid. As the gas is diverted from the anchor to the casing annulus, this passage must be open to the surface and must be subjected to a minimum back pressure. Obviously, a gas anchor will not function if the casing annulus is closed with a packer, or if it is shut off at the casing head.

Most oil wells can be pumped satisfactorily with the properly designed conventional gas anchor. A typical gas anchor design for a bottom hold-down pump is shown in Figure 4. Note that the perforated nipple is located adjacent to the seating nipple, and the gas anchor pipe extends below the perforated nipple. To achieve good separation the gas anchor pipe should extend about five feet below the perforated nipple. Also, the total area of the holes in the nipple must be sufficient to permit the simultaneous passage of oil through the lower holes and gas through the uppermost holes.

A typical gas anchor design for a top hold-down pump is shown in Figure 5. The perforated nipple is located adjacent to the seating shoe. As the pump body extends below the perforated nipple, it will serve as a gas anchor, and the gas anchor pipe can be shortened or eliminated. Shortening or eliminating the gas an-

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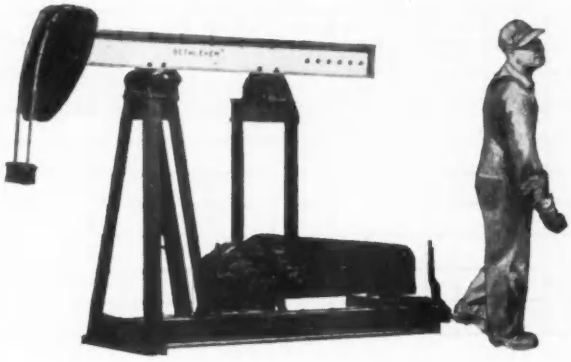

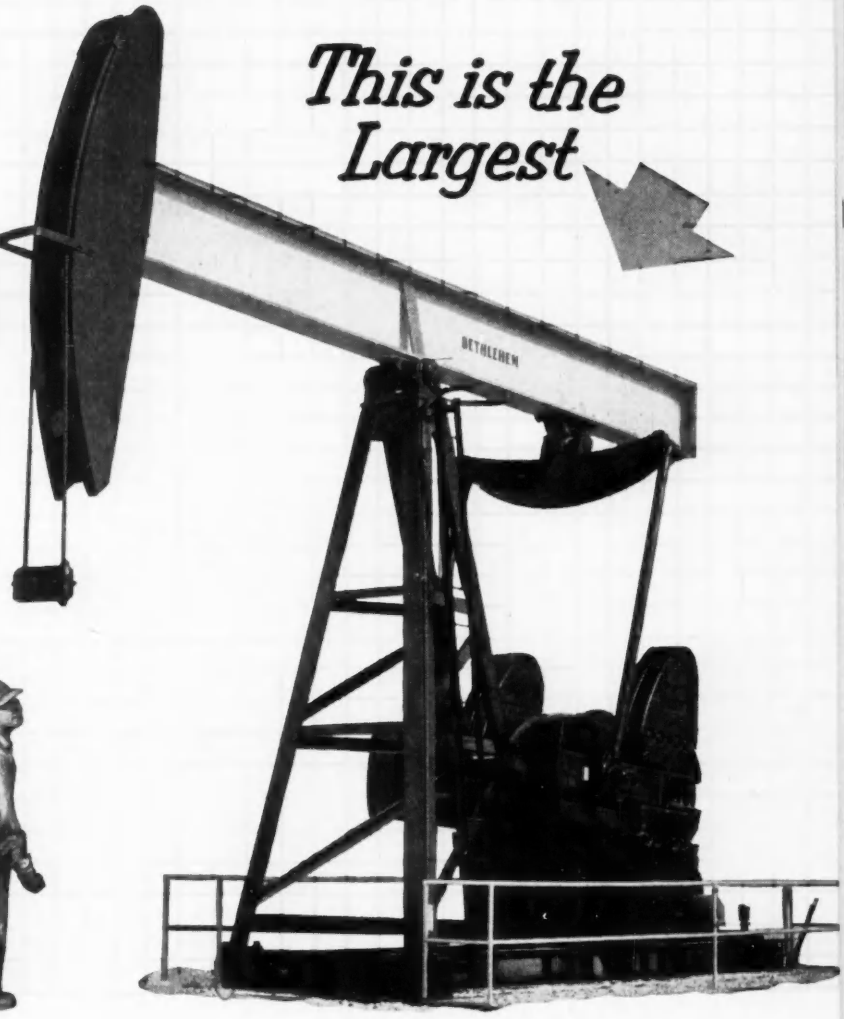


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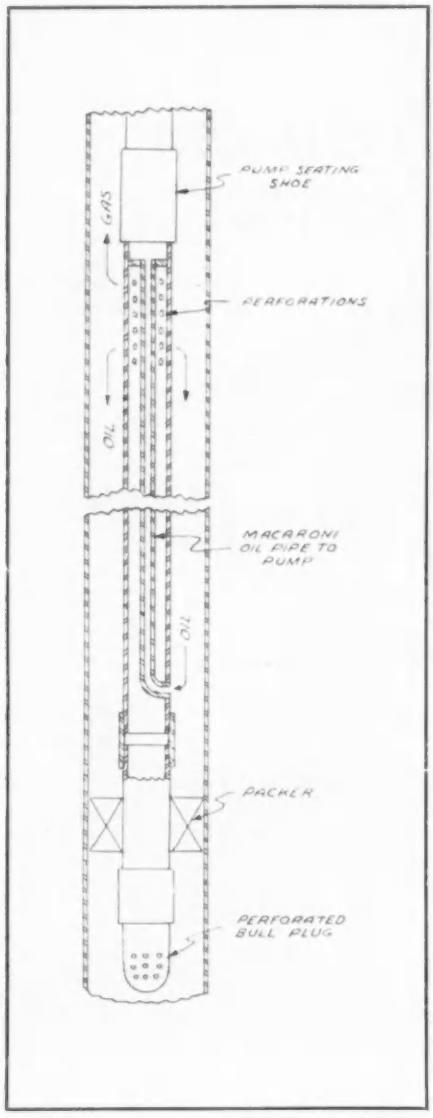


**Fig. 8**—This specially-designed gas anchor provides agitation and relatively large volume in annulus where gravity separation is effected.

chor pipe decreases the pressure drop in the pump suction system and reduces the probability of gas being liberated inside of the pump. This design may not be effective in all types of wells, because the downward velocity of the fluid in the space between the pump body and mud anchor may be too great to permit the gas to raise and pass out through the upper perforations.

In this case the gas anchor design shown in Figure 6 should be used as it affords a larger down pass area. This design is desirable in wells which produce a corrosive fluid or wells which produce some sand and have a tendency to head. It is desirable in corrosive wells because the space surrounding the pump will be filled with stagnant oil which is usually noncorrosive. If the well heads, the high velocity sand laden oil passing through the perforations will impinge on the gas anchor pipe rather than the pump body. Consequently, the pump body will not be subjected to damage from exterior erosive wear.

**Special Types.** Several types of specialized gas anchors have been developed for use in wells where common anchors fail to provide adequate separation. One of these devices is shown in Figure 7. This type employs three concentric tubes with holes for fluid passage which create agitation to consolidate gas bubbles. Annular spaces between tubes are provided with gas escape holes at their upper ends.

Another specialized type of gas separator is shown in Figure 8. Fluid flows up through the blind section of the tubing and out through the perforations at the top. Fluid then falls from the perforations to the packer and enters a small macaroni string which conducts it to the pump. Severe agitation produced by fluid flow through the perforations tends to remove free gas from the fluid. Low fluid velocity in the annular space gives excellent gravity separation. Consequently, the pump is supplied with relatively gas-free fluid. This principle of gas separation is currently available in two devices which employ rather simple seals between the tubing and casing and do not require conventional packers.

**Production by Heading.** The unrestricted flow generally characterized as "heading" in pumping wells is a gas problem which may adversely affect the life of the pump. Its effect on pump life is dependent on the nature of the producing formation. If the formation is an unconsolidated sand, the high flow rates prevailing during this period will carry sand into the well bore. This will increase the volume of sand passing through the pump and will decrease its life. If large volumes of sand are carried into the well bore, the sand suspended in the tubing may settle on top of the pump when the well ceases to flow and stick it in the tubing.

When a well heads, fluid passes through the pump at a velocity substantially greater than that occurring during normal pumping operations. This causes the balls to spin in their cages. Ball guides wear at a rapid rate and fail to properly guide the

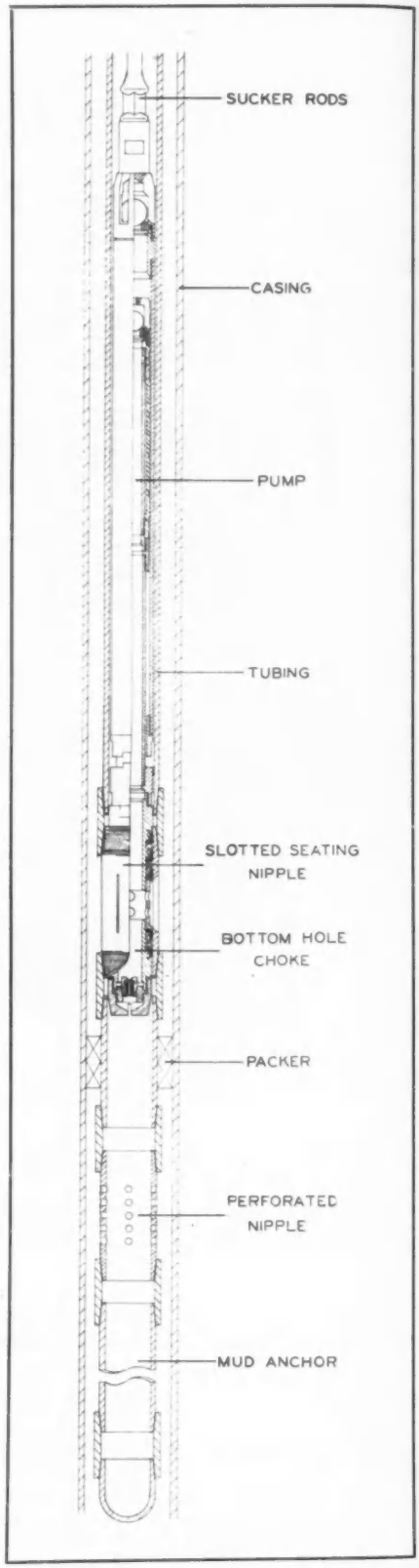


**Fig. 9**—Heading has been controlled by using a choke below pump to control rate of flow into casing annulus. This is a typical installation.

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ball into its seat. This leads to premature ball and seat failures and may cause cage failures.

Heading can cause excessive rates of wear in metal to metal pumps, because it decreases the supply of oil available for plunger lubrication. Metal plunger pumps are dependent on fluid slipping by the plunger for lubrication, and the rate of this leakage is a function of the pressure differential between the ends of the plunger. It decreases as the pressure differential is decreased. It becomes zero when the well is heading, because the pressures at the two ends of the plunger are equal. Under these conditions the plunger is dependent on the oil film adhering to the barrel for lubrication. To assure adequate lubrication under these conditions, clearance between barrel and plunger must be sufficient to permit the plunger to pass over an oil film without scraping the barrel dry.

**Bottom-Hole Chokes.** Tendency for a well to flow by heads can be materially reduced by holding a minimum back pressure on the casing annulus. However, this procedure may not be practical when producing high gas-oil ratio fluids from an unconsolidated sand formation. When producing a well of this type it may be necessary to hold a regulated back pressure on the casing annulus and use a choke in the flow line to control the maximum production rate. Size of choke must be chosen that will not impose excessive loads on the pump.

If the well is pumped with electric power, adverse effects of heading can be controlled by shutting the unit down when the well starts to flow. This can be accomplished by placing a pressure actuated switch on the upstream side of the surface choke. Choke size can be selected to limit the maximum rate of flow during heading, and pressure on the well side of the choke can be used to control the pumping unit. When the well starts to flow, this pressure will increase and a pressure switch will shut the pumping unit down. When the well stops flowing, this pressure will drop and the pressure switch will start the pumping unit up. When the pumping cycle is controlled in this manner, the pump is not required to operate when the well is flowing.

The relative amounts of water and oil produced from a water drive field may be influenced by the high production rates accompanying heading. If the well is produced at a low rate, the water level in the formation tends to rise at a uniform rate and maintains a uniform pressure in the reservoir. If the production rate is high, the resulting pressure differentials in the formation encourage the water to come up to the well bore.

During the flowing life of wells in reservoirs of this type, the rate of water encroachment is usually controlled by imposing a back pressure on the well to control its rate of flow. For several years this principle has been applied to pumping wells in the East Texas field to eliminate the harmful effects of heading.[1,2] A subsurface choke below the pump controls the rate of flow into the casing annulus above a packer. The pump receives fluid from the reservoir in the annulus. General arrangement of subsurface equipment used in these installations is shown in Figure 9. The choke assembly is attached to the lower end of the pump and serves as a hold-down. It is run into and removed from the well with sucker rods.

All produced fluid must pass through the choke. When the well is shut down, fluid will pass through the choke until the pressure of the fluid column in the annulus equals the pressure on the lower side of the choke. During this phase, fluid passes through the choke and out into the annulus through the perforations and slots above the choke. The rate of flow from the formation to the well bore is under constant control. This system of water control has achieved remarkable results in the East Texas field when applied before excessive rate of water production has occurred. It should be equally applicable to any water driven field with similar reservoir characteristics.—**The End.**


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## Decline Curve

■ CONTINUED FROM PAGE 186

paper. Rate versus time on cartesian paper is a straight line. This type is not often found in the field. Equation for this type is $P = a - bt$, where a and b are constants.

Another unusual case is where the difference in production rates plotted against time is a straight line on regular graph paper. Thus, the $\triangle P$ versus t curve is a straight line on cartesian paper. Equation of this line is $P = a \pm bt \pm ct^2$, where a, b, and c are constants.

Another type of curve can be identified. In this case, a straight line is formed when the difference in values of $(\triangle P)$ data is plotted against time on cartesian paper. This equation is $P = a \pm bt \pm ct^2 \pm dt^3$. The plot of $\triangle (\triangle P)$ versus t is a straight line on regular graph paper. This type of curve does not have a suitable asymptote at infinite time.

Effects of permeability variations for the Bradford sand appear to indicate a reciprocal function of the second power of t in the decline curve equation. The equation $P = \frac{a}{t} + \frac{b}{t^2}$ may be appropriate for some water flood decline data. To identify this type of curve the following may be used:

(1) $\triangle\left(\frac{1}{P}\right)$ versus (t) is a straight line on cartesian paper or,

(2) (Pt) versus $\left(\frac{1}{t}\right)$ on cartesian paper is a straight line or,

(3) (Pt) versus (t) on reciprocal paper is a straight line. (Time values are plotted on the reciprocal scale.)

Another type of decline curve which may be used on some unusual data if no other type of curve is suitable is the plot of log P versus t on semi-log or on log-log paper where the log P values are plotted on the log scale. This may give a straight line and thus is a useful tool for decline curve analysis. —**The End.**


ACKNOWLEDGMENT

The author is indebted to Professor Ralph F. Nielsen, Petroleum Engineering Department, Pennsylvania State College, who contributed in the development of much of the work presented in this paper.



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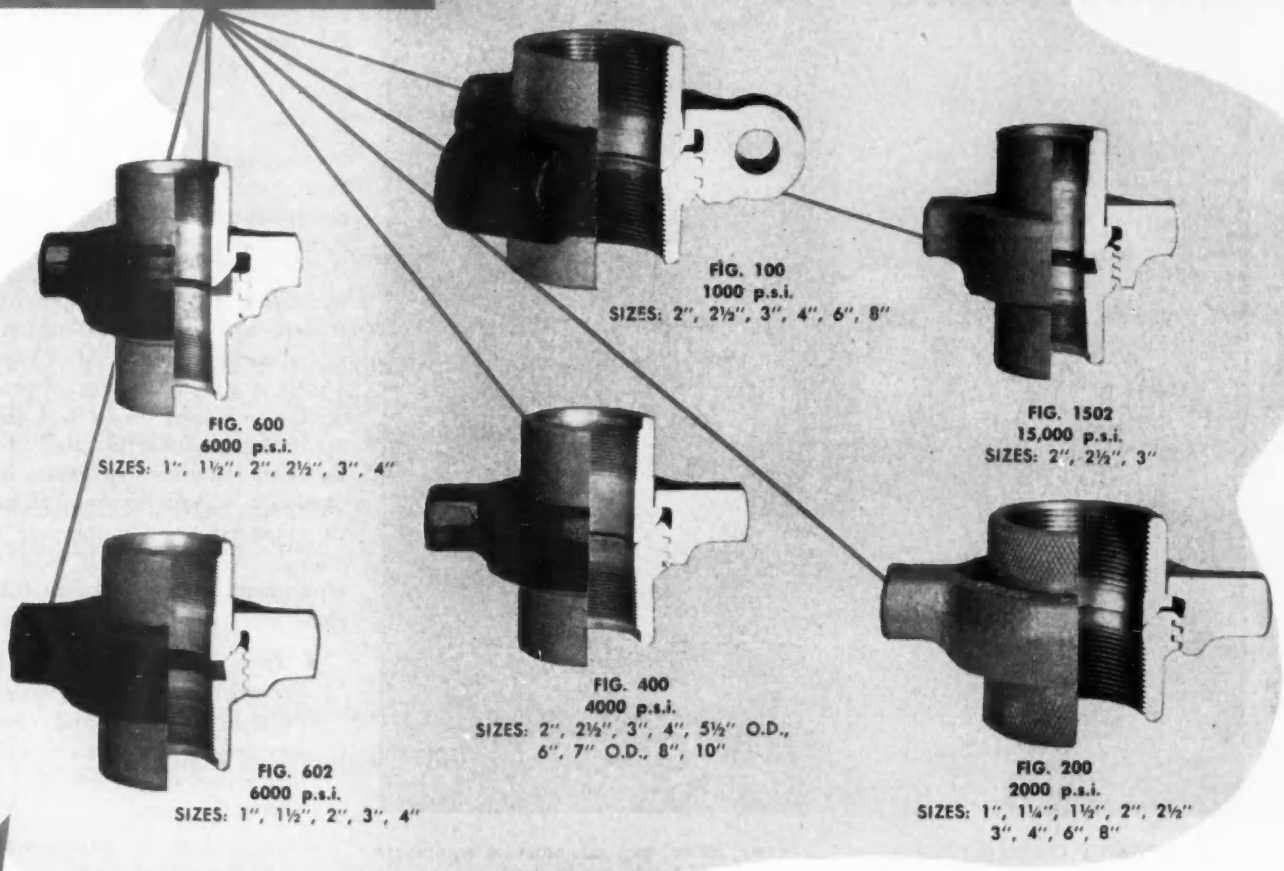

FIG. 100
1000 p.s.i.
SIZES: 2", 2½", 3", 4", 6", 8"

FIG. 600
6000 p.s.i.
SIZES: 1", 1½", 2", 2½", 3", 4"

FIG. 1502
15,000 p.s.i.
SIZES: 2", 2½", 3"

FIG. 400
4000 p.s.i.
SIZES: 2", 2½", 3", 4", 5½" O.D.,
6", 7" O.D., 8", 10"

FIG. 602
6000 p.s.i.
SIZES: 1", 1½", 2", 3", 4"

FIG. 200
2000 p.s.i.
SIZES: 1", 1¼", 1½", 2", 2½"
3", 4", 6", 8"

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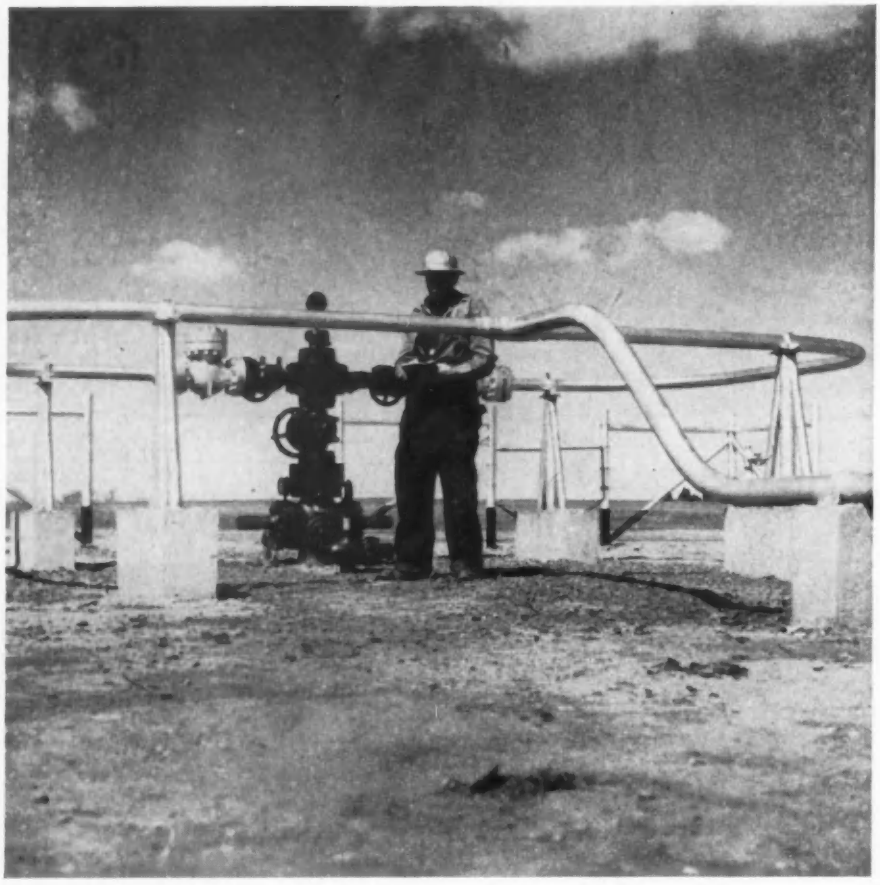

**CHECKING UP ON EQUIPMENT.** An accurate, on-the-spot inventory of equipment installed on a competed well will save money and headaches in the future.

# Materials Control Can Save You Money

**How to plan and carry out a program that will avoid many production pitfalls.**

**By J. TILMAN USSERY,**
President, Oil Country Inventory Service, Tulsa

MATERIALS CONTROL in oil producing operations, if practiced consistently and intelligently, can be a very valuable asset to the producer, whether he owns a small lease or engages in widespread operations.

Its results are felt throughout an organization in terms of smooth operation, cooperation instead of antagonism between field and office, and the satisfaction of knowing that maximum profits are being realized from every dollar invested in equipment.

Any operator with enough capital and know-how and the proper amount of luck, can drill and obtain an oil well. It requires, however, many people and many skills to enable him to keep his finger on the physical and financial pulse of this well in order to know just how profitable is the well and to be certain that no phase of drilling, completion or production has been overlooked that might result in diminished profits. One of these important skills, sometimes not fully appreciated, is good materials control.

**Effect on Profits.** An operating partner in a joint venture does more than just produce oil. Among other things he is also a vendor of oil field equipment. Unlike a supply house, however, he does not sell the equipment in its entirety and transfer the title of ownership 100 percent. He will retain ownership of his share of the equipment and sell the remainder to several non-operating partners. Nevertheless, he will still be held responsible for seeing that the equipment is installed, operated and maintained safely and efficiently. After equipping a well or a lease the normal procedure of the operator is to bill his non-operating partners for their share of the cost. If he fails to do so—and this oversight is more common than might be expected — the operator will be charged with the full cost of the equipment. Furthermore this oversight will:

- Make it impossible for him to reconcile the inventory of his warehouse stock and cause him to pay unnecessary time and overtime in his efforts to get a reconciliation.
- Cause him to pay unwarranted additional ad valorem tax on warehouse stock which has actually been in use on the lease but which, due to inefficient control, is still on the books as warehouse stock.
- Distort his balance sheet values.
- Result in a double loss for the operator when the well or lease is abandoned, by crediting non-operating partners for payments of equipment for which they were never billed.
- Cause additional loss of time and money in checking other leases for similar oversights.

These and other factors which cause loss of time and money can be avoided if careful materials control is practiced so that the operator will get the full value for money invested in equipment.

**Basic Facts.** The basis of the entire materials control system is the proper use of the all-important form known as the "Material Transfer" (Figure 1). It is through the use of this form that the field notifies the accounting department of all movements of materials, and it is from this notification, efficiently prepared, around which the

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APPROVED: WAREHOUSEMAN:

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APPROVED SUP'TND OF MATERIALS | SUPERINTENDENT

PRICED BY | CALCULATIONS CORRECT | DISTRIBUTION | POSTED TO STOCK LEDGER

ORIGINAL:

CONDITION
1—100%—NEW
2—75%—GOOD SECOND HAND
3—50%—FAIR SECOND HAND
4—25%—BAD ORDER
5—JUNK

SPACE BELOW FOR OFFICE USE ONLY

ACCOUNT CLASSIFICATION

| GENERAL | SUB | FEA | DETAIL | AMOUNT |
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Fig. 1. A material transfer form such as the one shown above will aid considerably in accurately accounting for costly equipment.

entire system of material control evolves. This form, if improperly used, or if not used at all, will reflect in reduced profits and many bookkeeping complications.

It cannot be too strongly emphasized that the understanding and proper use of the material transfer form is of paramount importance in oil producing operations. Older lease men should be reminded, and newcomers informed, that the use of this and related forms has proven its worth over many years of materials control experience.

The material transfer form usually is prepared by one of the following individuals: warehouseman, when a warehouse is established; or by the district superintendent, district engineer, district clerk, farm boss, head

**TUBULAR GOODS INVENTORY**

DATE (LAST DAY OF CURRENT MONTH)

SIZE O. D. | WEIGHT | GRADE | RANGE | THREADS | COND | MANUFACTURER | LOCATION

| DATE OF MOVEMENT | VENDOR AND INVOICE NO.—E. O. NO. WELL NUMBER—MATERIAL TRANSFER NO. | RECEIPTS JTS. | RECEIPTS FOOTAGE | DISBURSEMENTS JTS. | DISBURSEMENTS FOOTAGE | BALANCE JTS. | BALANCE FOOTAGE |
|---|---|---|---|---|---|---|---|
| | OPENING BALANCE—Carried forward from last report. → | | | | | | |
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| BALANCE ON HAND (Last Day of current month—This balance to be carried forward as Opening Balance for following month.) | | | | | | | |

REMARKS

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Fig. 2. Monthly tubular goods inventory reported on this type of form provides a careful check on the most expensive items usually found at the warehouse.

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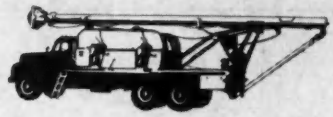
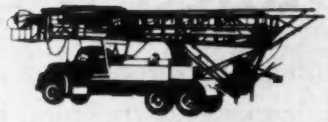
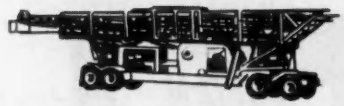
CRUISER 

ROCKET 

COMET

CLIPPER 

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roustabout, pumper, district and materials supervisors or accounting personnel. Trucking and supply companies, when material is stored in yards or warehouses owned by them, should also be required to use the form so as to aid the company in its constant effort to control materials.

The size of the organization and the type of operation, whether drilling in a proven area or cross country wildcatting, will determine which of the employes named above will make the transfer. For example, if a company is developing or has developed extensive holdings in an area within a radius of approximately 50 miles, undoubtedly it will have established a central warehouse and have it properly staffed with clerks and warehousemen, or a district materials man serving in all three capacities. If such is the case, the materials should be fairly well controlled. However, in isolated areas where a company has eight or ten leases scattered over an entire state a serious problem in materials usually exists. This problem is immediately apparent and easily understood when it is realized that in such a case the area, being statewide, usually will be serviced by a production superintendent and possibly two engineers. In some cases only one engineer is responsible for an area covering an entire state. Work invloving material control may appear burdensome, and often unnecessary to the engineer who probably believes that his principal function is to produce oil efficiently and economically. However, if the work is neglected or improperly carried out, the effect will be reflected in a poor showing, so far as profits and orderly management is concerned.


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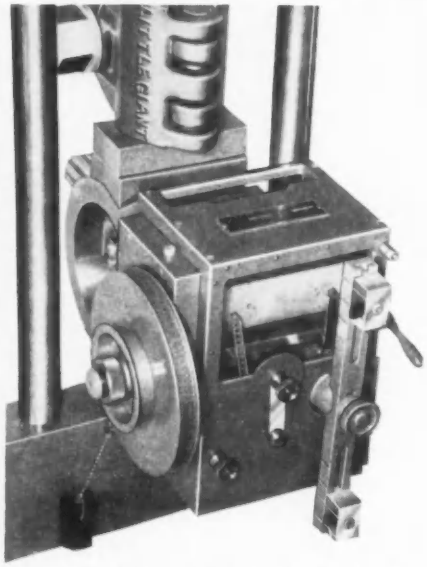

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**Individual Responsibility.** Every oil-producing company, large or small, should employ a well-trained materials man. It should be his responsibility to make field men understand and appreciate the importance of materials control. Whenever necessary he must give "on-the-job instruction" and be able to change the "paper work" habits of field men where such habits are shown to result in poor control of material.

Major oil companies understand and appreciate the worth of a good materials man. Smaller companies and independents should, wherever possible, include such a man on their staffs. A competent man will save the company many times the amount of the salary he may receive in the course of a year. In the long run, oil production equipment costs a great deal of money and must be properly accounted for, not only in the warehouse, but throughout its many and devious transfers during the course of operations.

It is important to stress that the materials man should be free to travel between office and field as the need arises. Otherwise the full value of his services is lost because during frequent trips to the field he is in a position to observe conditions and give important on-the-job instructions to field men.

Field men should primarily be instructed in:

- The fundamentals of material control; how to properly make out all materials control forms and exactly what function each form serves.
- The proper way to describe material so that the office can

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identify it; the importance of giving size, weight, grade, type, model, serial number and other specifications or characteristics of equipment so as to make its identification easy and rapid.

- The importance of making out material transfers on the spot whenever material is moved or received.
- An understanding of what happens to these forms when they reach the office and the difficulties and losses involved in failing to make a proper and prompt record of all transfers.

An understanding of the above fundamental principles in materials control will help field men see why the office needs such forms and how important they are in operations.

**When to Begin.** Control should begin when a company or operator first drills and completes a producer or a dry hole. If a good, sound program is started at this point, adhered to and added to as the operations expand, it will be found that a quick and intelligent forecast and analysis can be obtained right down the line on any phase of the operations.

**Periodic, Accurate Inventories.** Physical inventories are the final check to see how well a materials control program has functioned. It is at this time that the mistakes are uncovered. If, for any reason, the field may have an antagonistic attitude towards materials control, it is because such control serves to emphasize past errors and ommissions.

Annual inventories of warehouse stocks are of the utmost importance and necessity. Turnover in this account is naturally large and great quantities of receipts and transfers are made debiting and crediting this account annually. At the close of the fiscal year it is almost necessary to obtain an accurate valuation of warehouse stocks to help arrive at the company's net worth in order to compute the actual profit or loss for the year.

Usually the largest capital investment in warehouse stock is in casing, tubing, line pipe and sucker rods. If a close monthly check is kept on these items it will speed up the reconciliation of the inventory at year's end.

A good method for keeping a running count of these materials is through use of the form shown as Figure 2 and commonly called the "Monthly Tubular Goods Report." One of these forms should be made out each month for each size, weight and type of material and forwarded to the office where it is checked against the master card index. In this way, any errors can be noted and corrected with a minimum of rechecking.

A complete physical inventory of active producing leases should be taken every three to five years. Inactive leases, where there is no drilling or where no major changes of equipment have occurred, should be inventoried at a minimum of every five years. An excellent practice is to have a complete inventory of each well as it is completed. In this way most material which the field has failed to transfer will be noted within a few days after completion, instead of having to wait from three to five years for the company-wide inventory.

—The End.

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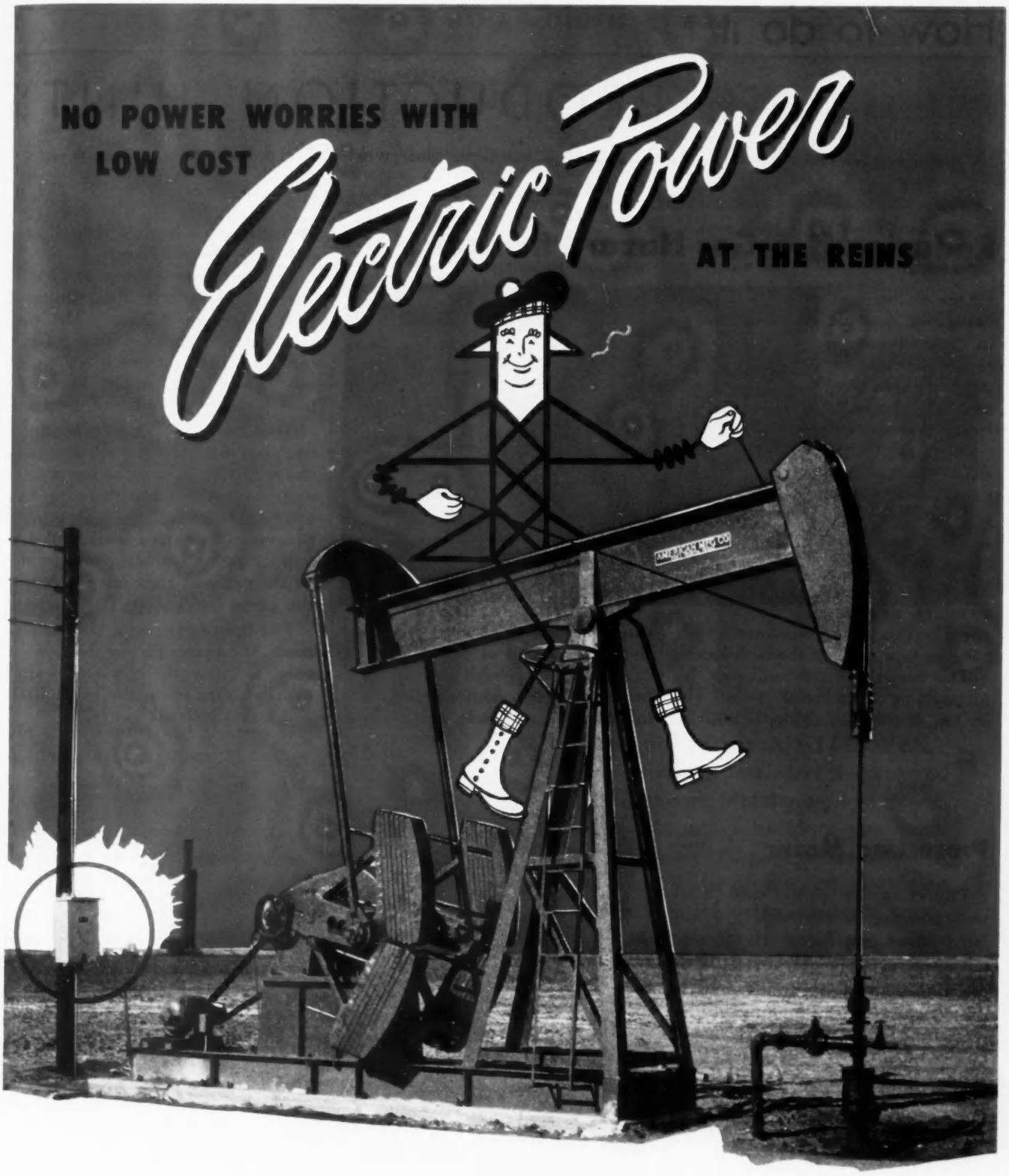


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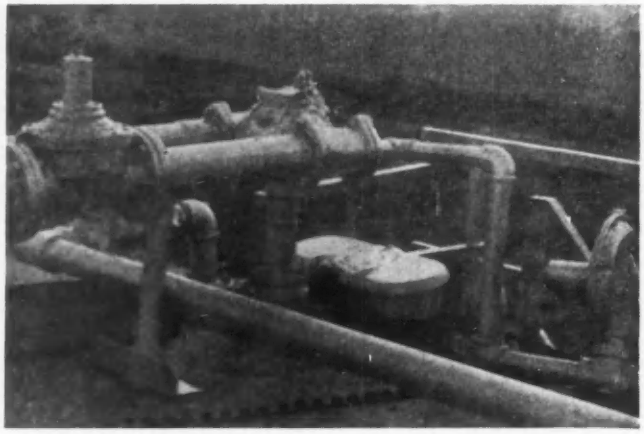
# How to do it

# PRODUCTION HINTS

**$10 is paid for each illustrated acceptable contribution. Mail to The Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas.**

## Reducing $H_2S$ Gas Hazard in Tanks



One of the most dangerous hazards in production operations is that of gauging tanks containing sour crude. High concentrations of hydrogen sulphide gas can paralize and kill without warning; smaller concentrations can cause black-outs. Tank gaugers are exposed to this hazard when running a gauging tape through the tank hatch.

This hazard may be minimized by maintaining a blanket of "sweet" gas on top of the sour crude. When the gauger opens the hatch, sweet gas rises so that little of the $H_2S$ gas escapes the tank. Such practices also prevent the poisonous gas from killing crops or livestock on the lease, since the gas is heavier than air and will settle on the ground.

Field gas from a sweet gas well is piped to the battery and reduced to four ounces of pressure. The tank vent line is equipped with a pressure regulator which opens when this pressure exceeds four ounces. This regulator is shown in the left of the photo.

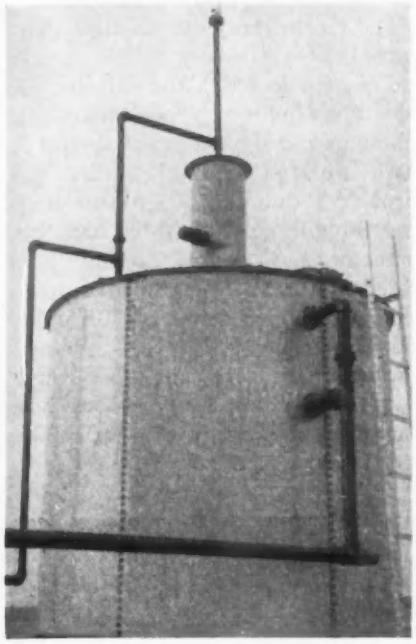
The vent line, of four-inch pipe, is equipped with a bypass line around this regulator, so that the line may be opened to the atmosphere to take some of the gas off the tank prior to gauging. This bypass is controlled by a quick-action two-way valve located on the gas vent riser just in front of the gauge hatch.

Just before gauging a tank of sour crude, the gauger throws the two-way valve to bypass the regulator, waits a moment, then opens the gauge hatch and makes his tank gauge.

## Protecting Motor

Protect electric motors used in oil well pumping service with a ventilated sheet-iron hood. Day-in and day-out service in the oil fields by electrical equipment not properly protected shortens its useful life. Adequate protection against heat as well as rain and dust is afforded by this simple fabricated hood. It is all-welded from lightweight sheet iron, and equipped with a handle at the top for lifting. End covering the motor shaft is notched and the other end slotted to provide good ventilation.

Protecting these slots so rain will not enter the hood are several metal tabs welded to the hood at an angle to deflect water. The outside bottom edge of the hood is hinged to two strap steel members extending behind and anchored to the pumping unit skid. Servicing and inspection may be carried out unhindered by tilting the hood backwards for full access to the motor.



## Topping Tanks

A simple arrangement on the gunbarrel will save much of the pumper's time in topping out tanks. By putting a tee on the lower outlet of the gunbarrel and connecting a line back into the gunbarrel about 18 inches above, a reservoir for storing oil is made.

When a tank becomes filled to within a few inches of the topping out point, a plug valve on the lower line is closed which allows the oil to build up in the tank. However, if it builds up to a point near the top, it runs back into the same tank to which the pumper is running the oil and makes up part of the remaining few inches necessary for topping out. Now the pumper has a reservoir of produced oil which he can turn into a tank which is ready to fill. Within a few minutes after the plug valve is opened, his job is complete and he can turn the remaining amount of oil into the next tank to fill.

This connection can also be used if it is necessary to take both tanks out of service when the pumper is not present when the gunbarrel should fill. The overflow pipe will put the oil into whichever tank is left open rather than run the gunbarrel over.

## Dispersing Chlorine Gas

*Courtesy East Texas Salt Water Disposal Company*

Use a carborundum thimble to break chlorine gas used in treating salt water for injection purposes. Killing algae in salt water to be pumped back into a subsurface formation is essential to prevent clogging of the zone taking water. Chlorine gas added to the injected water is a well-known agent for doing this job. To get best results, the gas must be dispersed in

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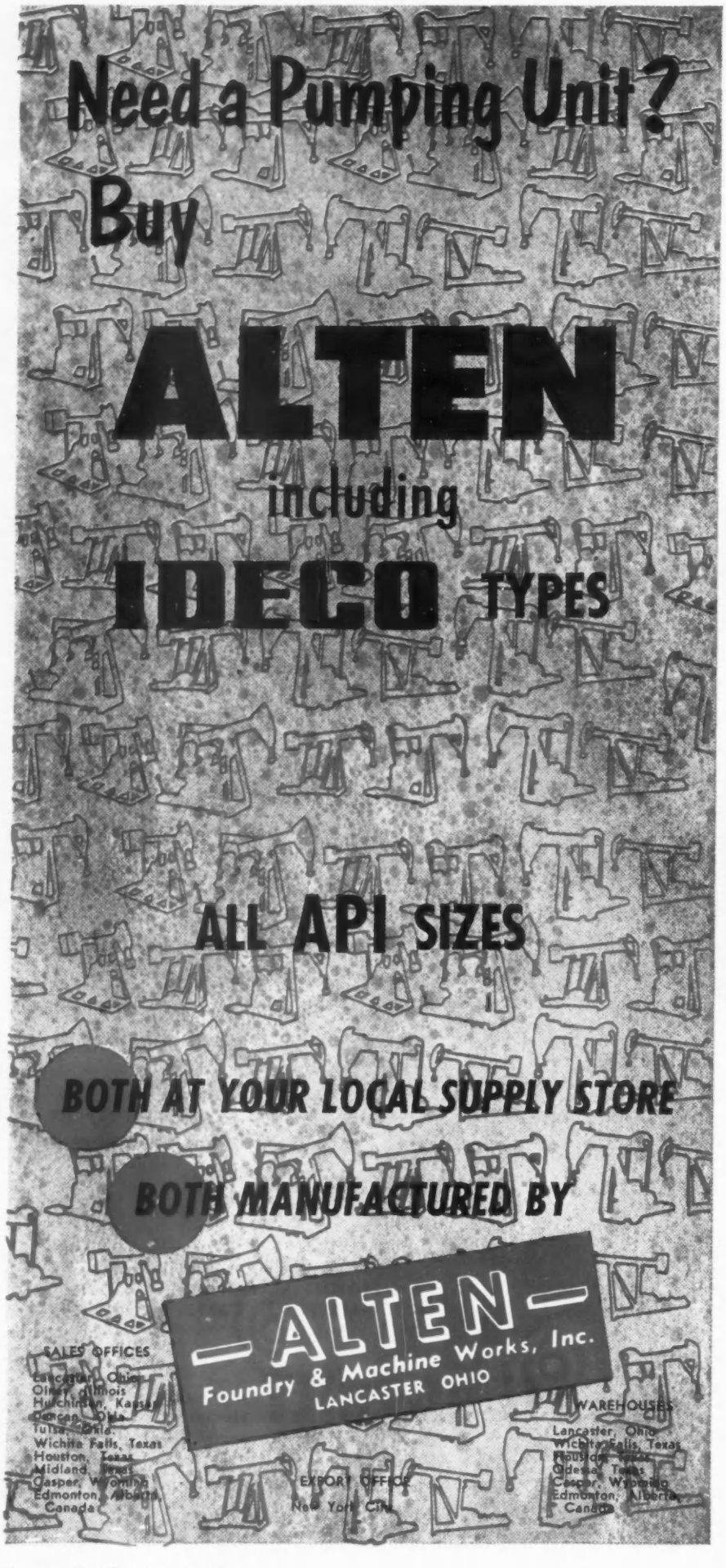
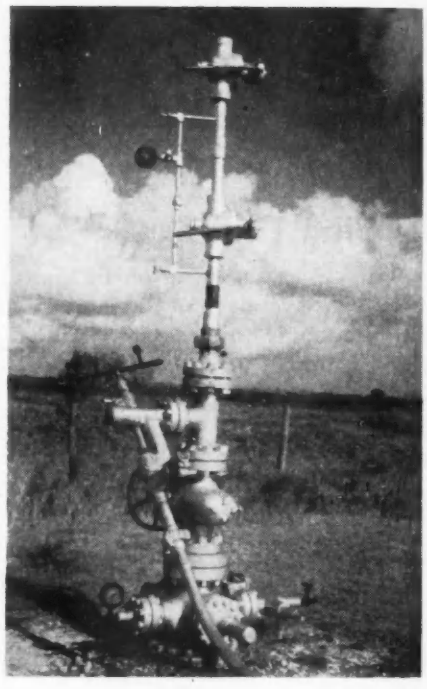





the water as thoroughly as possible.

The carborundum thimble illustrated has a porosity of 40 percent and is used to break the chlorine gas into tiny bubbles. This thimble is submerged in the water storage pit or tank and supplied chlorine gas through a quarter-inch rubber hose. The thimble is about three inches in diameter and 18 inches long. It is sealed at the lower end with a number four rubber stopper. The upper end also is plugged with a one-hole stopper that accepts a short length of plastic tubing. The rubber hose clamps to the plastic tube as shown.



## Lubricating Inhibitor

When gas wells are flowed intermittently, it is simple to add the solid type of inhibitor while the wells are shut in if the equipment illustrated is used. This equipment consists of two plug valves mounted on a series of pipe nipples with a quick acting wing union on the lower end and a valve on the top. An equalizing line which carries a pressure gage is connected between the lower nipple and the pressure chamber.

In operation, the chamber is mounted on the top of the christmas tree after the well is shut in. With the lower valve closed, the inhibitor is placed inside the valve on top after which it is closed. The equalizing line

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Guiberson H-2 Anchor with Type D Swivel Tension Bleed Joint

Guiberson H-2 Anchor with Type A Pressure Operated Bleed Joint

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***TYPE D SWIVEL TENSION BLEED JOINT***—Available in 2" or 2-½" tubing sizes. Either size shears with approximately 20,000 pounds tension at the joint. Ports in joint open when ring shears, allowing tubing to drain and thus release anchor.

***TYPE A PRESSURE OPERATED BLEED JOINT*** — Available in 2" or 2-½" tubing sizes. Blow plug is available in 1,000 p.s.i. increments from 3,000 p.s.i. to 6,000 p.s.i. Plug ruptures when pressure differential reaches plug rating. Joints should be ordered rated approximately 1,000 p.s.i. above expected operating pressures.

Guiberson's H-2 anchor may be released by normal methods of equalizing tubing and casing pressures or with either of the above two bleed joints.

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is then opened, putting pressure on top of the inhibitor plug. The lower plug valve and the well head valves are then opened so that the inhibitor will drop into the well by gravity. After the inhibitor is inside the tubing, the master valve may be closed and the equipment moved to the next well to be treated.

## Sampling Crude

Sample sour crude oil safely by utilizing a small separator that removes the hydrogen sulphide gas which is burned at a safe distance from the midget separator. Danger in taking sour crude samples is twofold. One, the pumper may come in contact with the $H_2S$ gas which may cause him to black out; and secondly, escaping gases may damage crops or kill livestock.

To alleviate this problem, locate a midget separator away from the tank battery and equip it with a gas line that terminates at a burning pit. Safest procedure in producing sour crude is to require that pumpers work in pairs. In this way, one can help the other should he accidentally inhale the poisonous gas. Of course, adequate gas masks are always employed where there is a danger of encountering hydrogen sulfide gases.

A one-inch sample line ties into this midget separator located a safe distance from the battery. The sepa-


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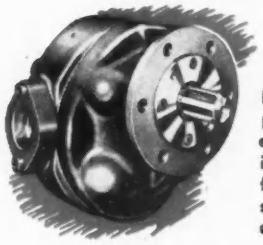

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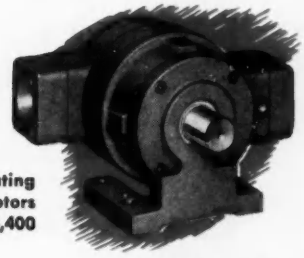
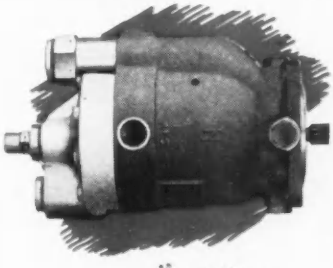


### DUDCO
### DUAL VANE TYPE PUMPS

**DUDCO Pumps provide a broad range of sizes with capacities to 120 gpm and pressures to 2000 psi. Also available in dual units operating from a single drive. Hydraulic motors with starting torque outputs to 14,400 lb. in.**



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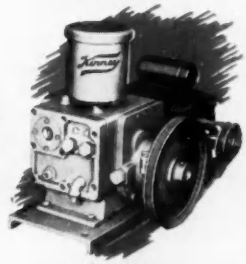


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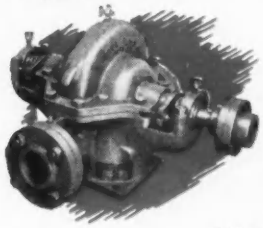

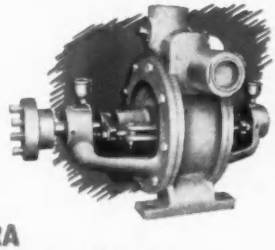

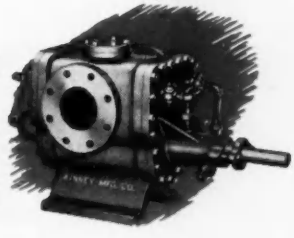

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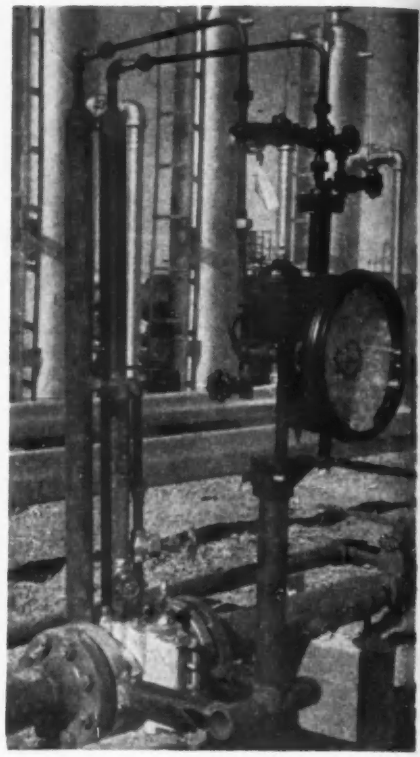
rator itself is fabricated from salvaged 8⅝-inch casing which has been orange-peeled and welded at both ends as shown. It is mounted on a tripod made of sucker rods welded to an old collar protector. The gas vent line, also of one-inch pipe, terminates about 50 feet beyond the midget separator at a burning pit. A valve tap at the bottom of the separator enables the pumper to take his sample.

Procedure is to let one pumper light the burning pit while the second opens the valve on the one-inch line to the midget separator. While the sour gas burns, one pumper, using his gas mask, draws a crude oil sample from the separator.

## Supporting Meter

Special concrete foundations and vertical posts were eliminated by attaching the supporting leg of this orifice meter chart to brackets welded to the orifice flanges. In this manner,

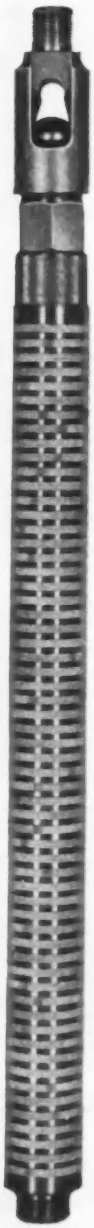


the recorder support may be taken along with the orifice for hookup anywhere.

The supporting bracket was made from two-inch pipe. In order to make it possible to change plates easily, horizontal brackets welded to the flanges had to be extended about 12 inches as shown. A cross member tied the two brackets together to form a foundation for the vertical support. A mercuryless type meter was then mounted on this two-inch upright member.

Of interest in this particular installation is the unusually large scrubbers used on the pressure lines to the recorder. Of two-inch pipe, these scrubbers are about five feet in length, and are supported by the pressure taps into the orifice body. Bottom of each scrubber contains a needle valve so the chamber may be drained periodically of any liquids trapped. One scrubber connects to the down-stream pressure tap, while the other ties into the upstream pressure connection.

Although the two-inch riser supporting the recorder may not be exactly vertical, four adjustment screws on the cap that fits over the support make possible fine adjustments that place the meter exactly in a vertical position.

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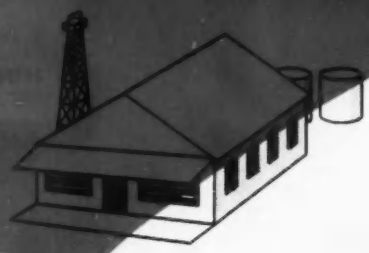

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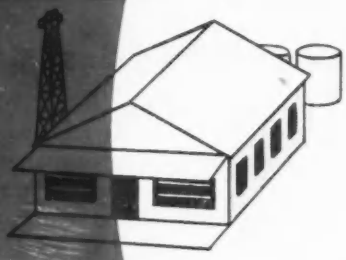

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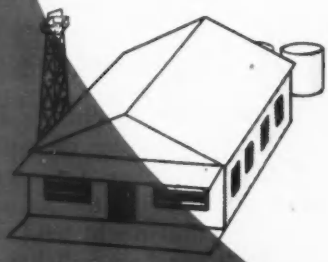

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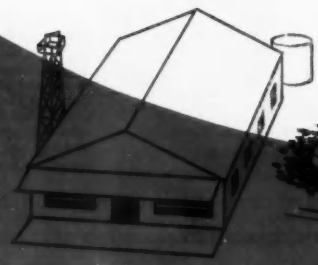

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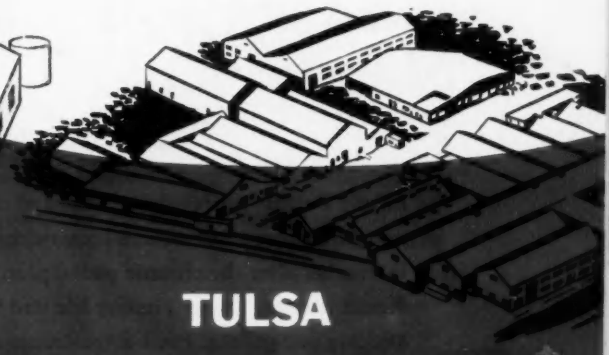

TULSA

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Since 1882

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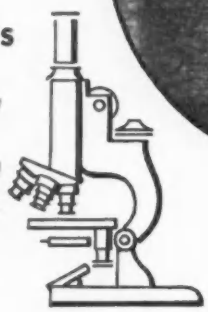
# The New Pacific

## PACILITE
(TRADE MARK)
## PLUNGERS
FOR DEEP
OIL WELL
PUMPING...

The number of surface reservoirs on top portion of enlarged section is characteristic of Pacilite treated chrome plungers. Bottom portion shows same surface .001" beneath finished surface.

HAVE MILLIONS OF
MICROSCOPIC PORES
*that actually soak up lubricants!*



Top portion of enlarged section shows comparison between depth and number of reservoirs at .001" beneath finished surface and .005" where controlled etching has eliminated reservoirs.

Pacific Pacilite process is a method of control etching a multitude of minute surface reservoirs to provide maximum retention of lubricants after the chrome plated plunger is ground to desired size. Result is much longer plunger life and virtual elimination of sticking and galling. Pacilite treatment also relieves high tensil plating stress and reduces possibility of cracking or shearing under heavy shock loads. For complete details write for Technical Bulletin No. 201.

PACIFIC *Precision Built* PUMPS

Pacific Pumps inc.
ONE OF THE DRESSER INDUSTRIES
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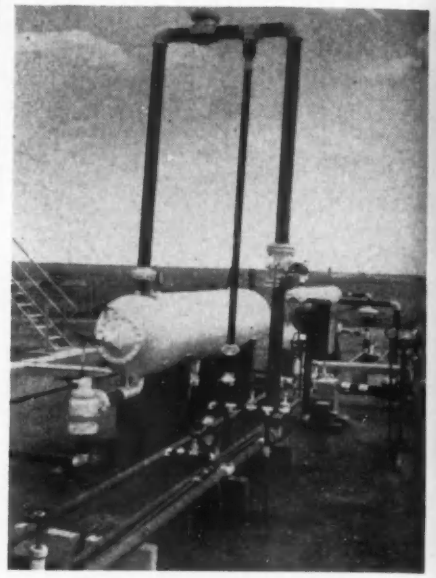


## Separating Gas

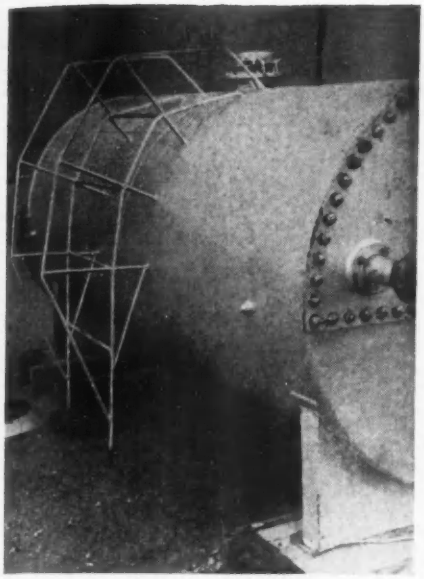
Where relatively large volumes of gas are handled in relation to fluid throughput in a horizontal separator, an extended riser on the gas leg will prevent some liquid carryover. Extend a four-inch line some ten feet above the separator shell. The line makes a 90-degree bend, runs horizontally for about six feet, then goes back to ground level to form an inverted U-section. The horizontal run contains a check valve and a tap for field gas.

The right leg is a meter run for measuring the volume of gas into a sales line. By extending the four-inch line into the air as shown, any liquid that might tend to carry over in the gas line, will have a chance to drip back into the separator. Such extension makes it convenient to include the meter run at a saving in piping.

### Order Your Copy of 1953 World Oil Index

**The complete editorial index covering all issues of WORLD OIL published during 1953 is being prepared and bound separately in convenient pamphlet form. It will be sent free to all subscribers who write requesting copies.**

**Orders should be addressed immediately to the Circulation Department, Box 2608, Houston 1, Texas, as quantities are limited.**



## Servicing Heater

A permanent ladder, made of sucker rod material, was welded to the outer skin of this indirect heater to facilitate servicing the unit. Since the fill cap of the heater was located on top, it was always necessary to carry a small hand ladder in the pumper's truck for use in filling the heater with water, or checking the water level.

Before the heater was placed into service, this permanent ladder was welded to the outer shell. It was made from salvaged sucker rods. Hand rails were added on both sides of the ladder that made it safe and easy for the pumper to check this indirect heater.

## Supplementing Gas

When a pumping well barely supplies enough gas to operate the pumping engine, the gas which comes off the tubing head may be added to the casing head gas in a simple manner. The arrangement consists merely of a copper tubing connecting a bull plug looking up on the flow line to the "other" side of the casing head; the other side being away from the connection leading to the fuel system of the engine.

In operation, the hose connection is taken loose from the casing head and the needle valve cracked on the bull plug to allow all the gas and a small amount of oil to flow through the copper tubing. Since the gas is

.0005" PERFECT

H-F Precision Rod Pumps run longer in tough wells because particular attention is given to the working fit of each assembly so that the close-fitting plunger and barrel tube will give long, efficient service. The barrel tubes are tough, non-gaulding seamless steel, machine-straightened, and finished to a perfect inside working surface. The plunger is a composite type, consisting of several 12" sections perfectly aligned on a seamless steel mandrel tube. The tolerance for these two vital parts in an exact .0005" during the entire manufacturing process.

Three combinations are available: *Standard Precision*, with plain steel barrel tube and alloyed cast iron plunger for moderate wear under average pumping conditions; *Precision-H*, with a hard chrome-plated barrel tube and hardened plunger (of Ni-Hard, a corrosion-resistant, nickel alloyed casting of inherently hard material) for abrasive and/or corrosive fluids, and *Precision-P*, with plain steel barrel tube and one-piece, chrome-plated plunger for hard-pumping.

If pulling jobs are costing you the price of a Precision Pump, why not run one to begin with? Ask your supply store — they'll tell you it's the best pump in the oil patch. Set one in your next well and see for yourself. H-F Precision Pumps, pump parts and accessories, and other production equipment are sold from stock by leading stores throughout the oil patch.

*Precision* PUMPS RUN LONGER IN TOUGH WELLS

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GENERAL OFFICES AND PLANT—FORT WORTH, TEXAS
Factory representatives in all major producing areas
"Best Pumps in the Oil Patch"

H·F Pumps

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OVER 80 SIZES AND MODELS
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22 models — ¼- to 25-ton

SAFETY-PULL RATCHET LEVER HOISTS
10 roller-chain models — 1,500- to 30,000-lb. ▶
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◀ CHALLENGER LIGHTWEIGHT ALL-STEEL SPUR-GEAR HOISTS
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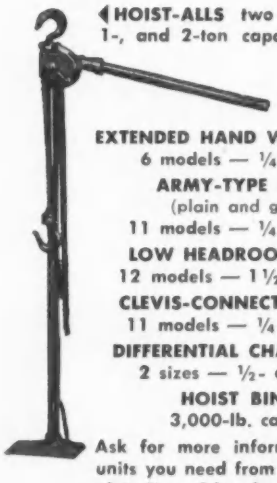

◀ HOIST-ALLS two sizes — 1-, and 2-ton capacities

*also:*

EXTENDED HAND WHEEL HOISTS
6 models — ¼- to 3-ton
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(plain and geared)
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2 sizes — ½- and 1-ton
HOIST BINDER
3,000-lb. capacity

Ask for more information on the units you need from the most complete line of hand-operated hoists. Write Dept. O12

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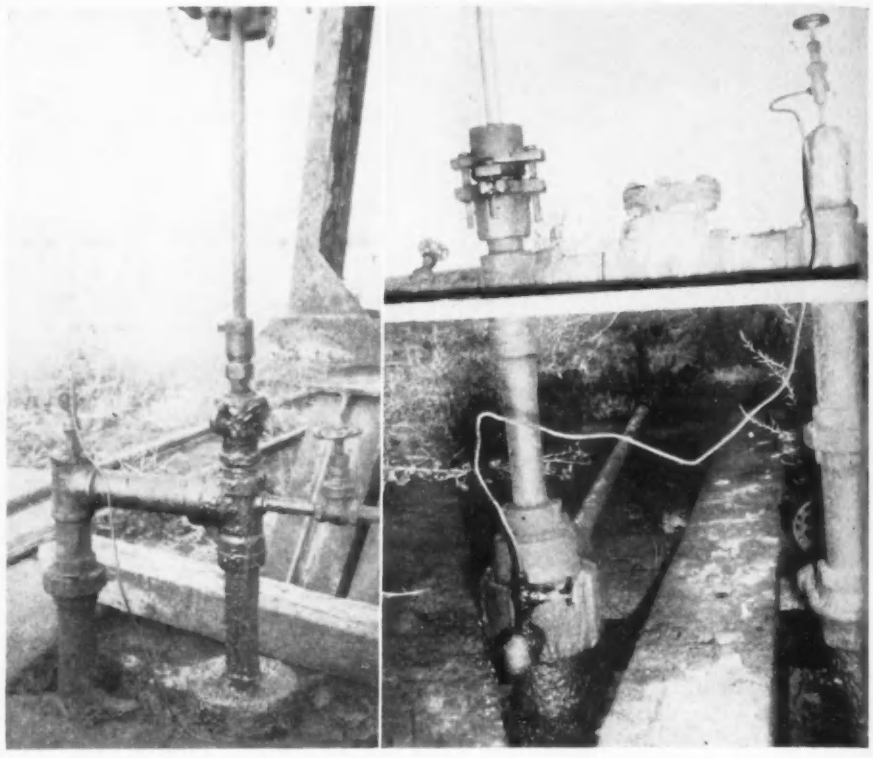

taken off the top of the line, all the gas that the tubing head makes is stripped from the oil produced. The small amount of oil that is caught with the gas is returned to the well bore and is pumped out again.


# ROLO WELLCHECKERS

PERMANENT AND PORTABLE SEPARATORS
FOR METERING OIL AND GAS

Field installation of trailer-mounted Rolo Wellchecker No. IH-2406

Made in various sizes to fit any operation, Rolo Wellcheckers are shipped completely piped and ready to operate. You need only connect inlet and outlet. In addition to oil meter, B. S. & W. sampler, gas run, orifice meter, fittings and all controls, free water knockout with meter can be furnished to separate and continuously remove free water from well fluid. See Composite Catalog or write for illustrated bulletin.

*Crude Oil Metering Specialists*

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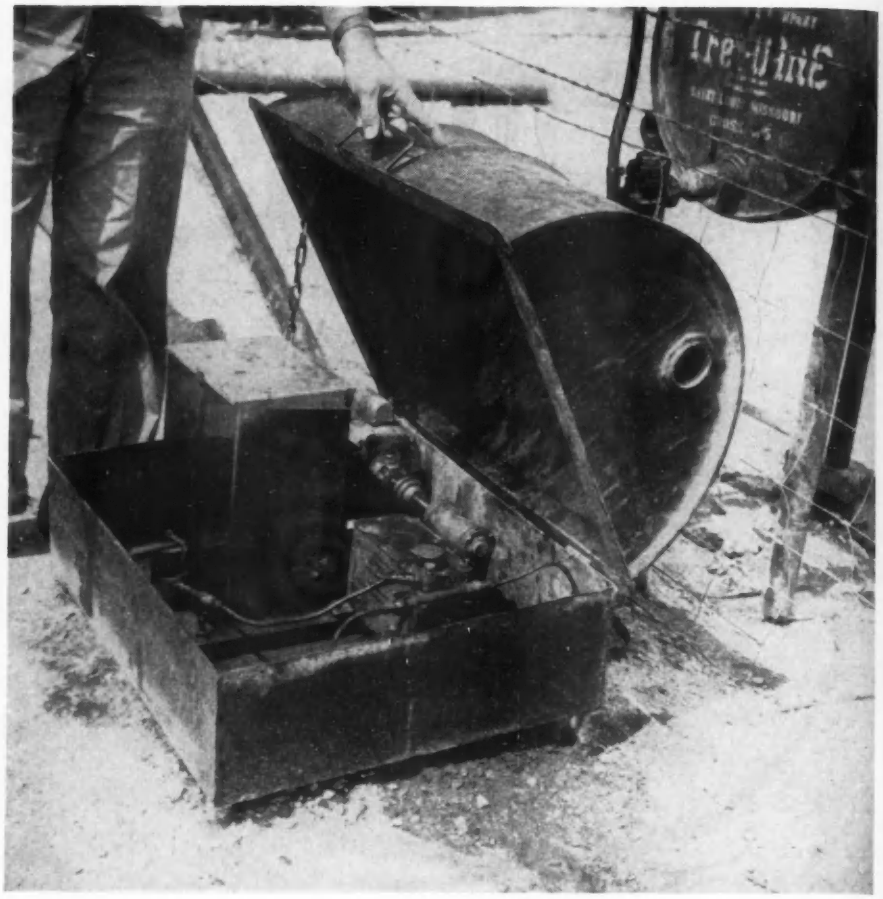
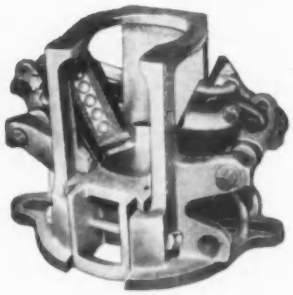
HINTS . . .

## Housing Injector

Service life of chemical injectors can be extended appreciably by housing them in all-weather structures. Here is a small field installation that encloses all the essential operating equipment for injecting a corrosive inhibitor into flow lines.

Top of the structure is half of a regular metal oil drum that has been flanged along the edges of the cut as shown. Base of the weatherproof housing is a sheet metal box that serves as a foundation for the chemical supply sump, the pump and an electric motor which powers the pump. The metal box is placed on four short sections of pipe driven into the ground so that the box is approximately level. The semi-circular lid is hinged to one side of the box, and fitted with a chain that supports the lid when opened slightly beyond a 90-degree angle. A drum of inhibitor is located nearby so that the job of filling the chemical sump is simple and quickly done. There is no upkeep to this housing, which adds years to the life of the pump.



*Air-powered*

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*(A Cavins Co. Product)*

*(Pat. Pend.)*

*Two of the many reasons why you will be glad to own an*

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**TUBING SPIDER**

**1** **SAFE AIR PRESSURE:** Because of the low operating pressure the slips will not release from the tubing until it has been lifted with the elevators.

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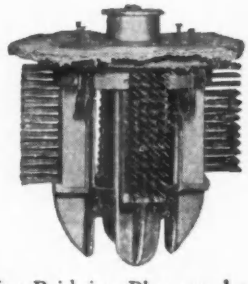
is the tool you need for dumping any amount of cement, sand, gravel, acid, or chemical, etc., in a continuous operation without interruption. The full open throat eliminates the hazard of stringing a load through the fluid column. There are no valves, sleeves, or ports to become fouled or clogged—no danger of accidental or premature unloading due to line whip or faulty brakes.

**THE CAVINS BRIDGING PLUG** ... for use in combination with the CEMENT DUMP BOTTOM, is ideal for use in starting an off-bottom bridge or plug. Made of drillable material, the Cavins Bridging Plug can be used for temporary or permanent installations.



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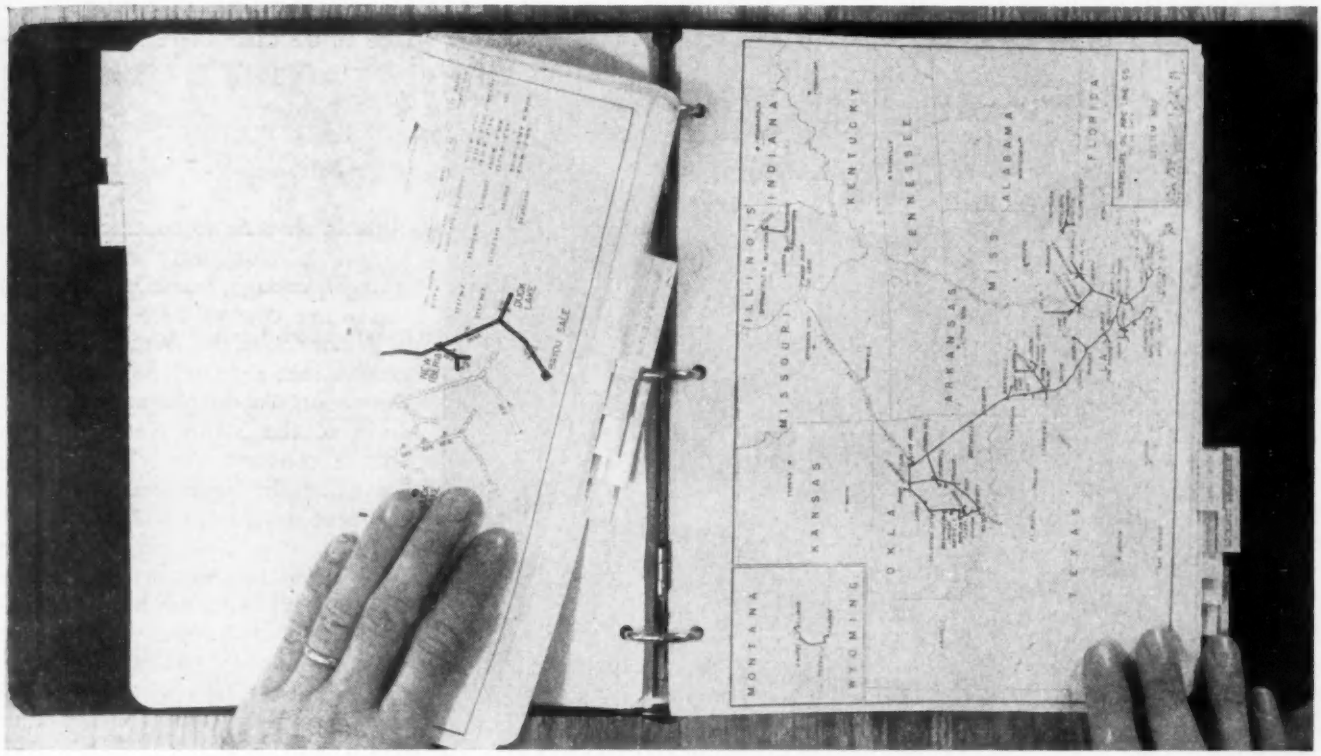



**INDEX SHOWS DRAWINGS** at a reduced scale.

# How a Pictorial Index Can Save You Time

**By B. G. SAUTHOFF,** Interstate Oil Pipe Line Company, Shreveport, La.

THE DRAFTING DEPARTMENT of Interstate Oil Pipe Line Company has proven that a picture or drawing is worth hundreds of words of description. A pictorial drawing index in loose leaf notebook form is being used every day to quickly find a map or chart to fit the needs of a fellow employe.

Company officials, supervisors, engineers or accountants, all find the index useful. A management conference is called and the index quickly finds a map or project chart, previously made, that will help the supervisor to illustrate his talk.

The list of uses is unlimited and the index is not in the least complicated. Here is how the index was put together. A loose leaf notebook with divider sheets was procured. Interstate map files were surveyed for all maps, charts, and graphs that could possibly be used by others. These drawings were then photostated to letter size (8½ x 11 inches) for easy use in the notebook.

Interstate was fortunate in having a photostat machine in its reproduction department where the reductions were made at a minimum cost. These indices were then grouped and placed in the notebook between the dividers according to the sections of company operations which they portrayed. Accordingly, tabs were put on the dividers naming these sections. These sections were then subdivided into maps, graphs, project charts, etc.

Examples of the names used on the tabs are: Wilson District, Shreveport District, Northern Division, Southern Division, Company Wide, etc. On each of the indices, for ready reference, was indicated the size of the original and its location in the map files, also the location in the files of a lantern slide, if one was made. The index is being perpetuated by the addition of each new map or chart as it is drawn.

Interstate has found the pictorial index to have the following advantages:

- Facilitates in helping other departmental employes to find the most suitable form of maps or charts for their needs from those already drawn.
- Eliminates searching through map files for several drawings to show employe a selection. As all maps and charts are in the index, the probability of overlooking one or two in searching is eliminated, thereby reducing the chances of having to draw a new one.
- Reduces the time required for the employes' choice, as there is no going from map file to map file, pulling out drawings, and after choice is made, returning the rest to the files, all of which usually takes from 15 to 20 minutes. This occurs many times in a week and the accumulated saving in man hours is considerable.
- The placement of a few of these pictorial indices in the offices of the company executives adds much to the efficiency of the drafting room in the eyes of the executives. At their finger tips they have a complete file on the charts and maps which they often have need for and thus requests for these can easily be handled over the telephone. —**The End**

**ROUGH TIME AHEAD.** At times the slope on the Clear Creek line was nearly vertical.

**It may not be the longest . . . and it may not be the biggest . . . but any way you look at it, it's the**

# 'Darndest Pipe Line' Ever Constructed

IT'S ONLY 63 miles long but—
- It's almost two miles high at places
- It passes through marsh land
- Gas flowing down the line picks up pressure sliding down hill

*"It may not be longest*
*"It may not the biggest—*
*"But it sure is the darndest!"*

That's how the builders of Utah Natural Gas Company's 63½-mile 18-inch transmission line from Clear Creek to near Provo, Utah, describe their project.

For this new line is probably the world's highest natural gas transmission line at this time. Elevation of the trunk portion of the line is 9800 feet near Clear Creek and its gathering system peaks at 10,400 feet—a shade under two miles up in the sky—in Carbon and Emery counties, Utah.

Mountains and canyons were a formidable obstacle to contractor R. H. Fulton & Company crews. But, strangely enough, marsh lands, streams and water courses were problems as well. For the mighty Wasatch Plateau scrapes rain right off the roof-top of the nation, flooding meadow lands in midst of the Manti National Forest with a constant supply of water in warm months of the year. In winter, the same meadows are blanketed with 15 to 20 feet of snow.

This new line which went into operation last month is a key line in the system of Utah Natural Gas Company (a subsidiary of El Paso Natural Gas Company). It taps the Clear Creek gas field which was discovered at the mountainous Wasatch Plateau in 1951 by Three States Natural Gas Company.

**Construction Begins.** Construction of the line started about May 15, 1953 at a highway take-off point near Indianola, Utah—about mid-point on the line. Work had been scheduled to commence from the Clear Creek field end of the line on that day but 15 feet of snow deterred the pipeliners. So instead, they worked back up the mountainsides from Indianola into the terminus of the line at the mouth of Provo Canyon, three miles north of Orem, a Provo suburb.

W. G. D. McElrath, superintendent of Utah Natural, says that "completion of the transmission line ahead of schedule, under the most difficult of working conditions, is a tribute in itself to the fine men who built it." He terms the construction of the field gathering system a remarkable engineering feat.

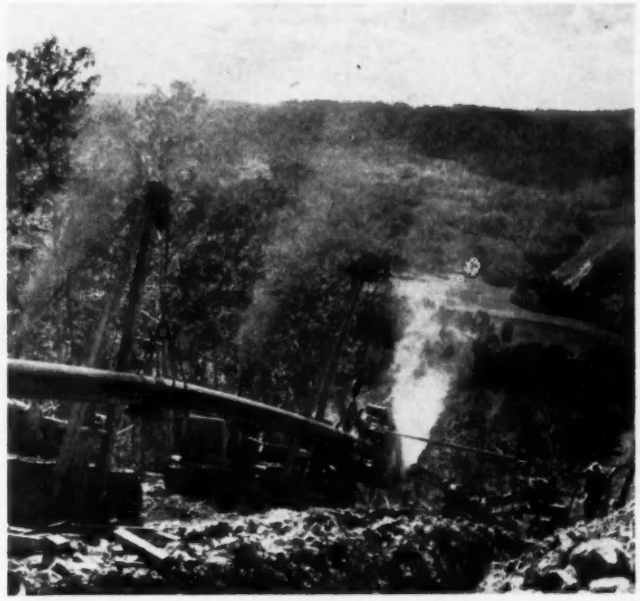
Gas commenced flowing into the lines of the Mountain Fuel Supply Company (distributor in northern Utah and southern Wyoming) the middle of October. Initially this company is taking 25 million cubic feet of gas per day. This will increase to 50 million in 90 days; and reserves permitting, volumes will eventually go up to 100 million.

The completion of the Paul T. Walton, 1-X wildcat on the southern portion of the Clear Creek field with an

## Here's why . . .

- **Gas flows from low pressure to high pressure. Delivering 25 Mmcf, it picks up 50 psi "sliding down hill."**
- **It's probably the world's highest pipe line. In places almost two miles up, with one grade 12 degrees from vertical.**
- **Mountains were not the only construction problems. The line crosses marshes and water courses, too.**

**THROUGH THE MOUNTAINS** of the Wasatch Plateau runs Utah Natural's 18-inch transmission line that carries gas down hill from the U. S.' highest field in central Utah.



**COATING AND WRAPPING MACHINE** moves up mountain. A tow tractor (not shown) gave the two sidebooms boosts with its winch.

**DITCHING MACHINE** climbs along the ledge cut out of the steep mountain slope by pipeliners.

**WAGON DRILLS** such as this were used frequently in the rocky terrain.

absolute open flow of 136 million cubic feet per day has added substantially to the proved reserves in the field. There are some independent surveys which place the reserves at as high as 1.25 trillion cubic feet. There is good reason to believe, therefore, that the volumes delivered through Utah's pipe line will eventually reach the projected 100 million cubic feet per day.

Because the surface of the gas field from which the pipe line draws its supplies is roughly 5000 feet higher in altitude than Provo, at which point deliveries will be made, there is an increase in pressure in the pipe line from the field to the terminus of the line at Provo. Delivery pressure will be 513 pounds per square inch. At a flow of 25 million cubic feet per day the pressure at the field end of the line will be 463 pounds; at a flow of 50 million cubic feet of gas per day the pressure will be raised to 496 pounds; at a flow of 100 million cubic feet per day, however, the pressure at the field will be raised to 595 pounds.

**Tremendous Task.** Construction of the line was a back-breaking task, the primary difficulty being the numerous and very steep mountains over which the line had to be laid. On the main line itself Jerry Nash, Fulton's spread superintendent, and his men had to conquer grades which were as steep as 58 percent. On the gathering system, however, they laid pipe line up grades that were as steep as 78 percent—only 12 degrees from absolute vertical. To solve the problem of these hills, Nash and his crews used tow cats liberally. These tow cats were used in hauling all equipment up and down the steep grades, including the ditching machines, the wrapping machines, and other such equipment. Some times the hills were too steep to be surmounted even by tow cats, and it was necessary for a cat at the top of a hill to winch up other cats and equipment coming from the bottom of the hill. Similarly and conversely, going down hill tow cats had to be used to keep the equipment from running away and on the steep hills an anchored cat had to use its winch to prevent a too rapid movement down the hill.

In spanning steep canyon streams of the Wasatch Plateau uplift, pipeliners ran the lines down the side as far as possible and bridged the gap with an aerial span. Most of these spans are under 15 feet in width and supported and anchored to take the force of freshets that come with summertime thaws.

Designers of the gathering system laid it out to provide for additional connections as "inside wells" are completed in the future.

Although both the gathering system and the main lines have roadway systems for access to all points, personnel of Utah Natural Gas Company anticipate considerable difficulty in reaching some parts of the line in winter months. The snow falls to depths of 15 to 20 feet during winter months, and drifts to depths of 35 and 40 feet. All maintenance crews will be provided with snow cats for line inspection, therefore. Personnel will also be equipped with skiis and snow shoes for movement by foot along the pipe line.

"We don't intend to let our men travel alone during the snow season" says McElrath. This precaution is taken with good reason—the winter season that starts in October and ends in May causes even the elk and deer of the region to shun the high altitudes of the Clear Creek Field. In the event of emergencies the crews along the pipe line will be able to call for help by mobile radios.

The field headquarters from which the line walkers will operate in the mountain area has been established between Clear Creek and Scofield—where Three States Natural Gas Company has its production department. This headquarters is under the direction of M. M. Edmiston, formerly with El Paso at Jal, N. M.

At the upstream terminal of the main line Utah Natural Gas Company has constructed a dehydration plant to remove what water there is in the gas. The gas from the Clear Creek field is sweet, fairly dry, and has very little liquid hydro-carbon content. The wells have a shut-in pressure of about 1100 pounds. They average about 5000 feet in depth. Well potentials vary from 10 to 40 million cubic feet per day. Production is from the Ferron Sand of the Cretaceous Age. This stratum is the equivalent of the Point Lookout Stratum of the Mesa Verde formation in the San Juan Basin.

**Boom for Industry.** Completion of this new system is having a vitalizing effect on industry in Utah. It will enable Mountain Fuel to bring gas service to Payson, Santaquim and Salem, Utah. Side valves were installed in the line at Ironton City near the Geneva Steel plant, Columbia Geneva Steel Division, United States Steel Corporation.

Paul Kayser, president of both El Paso Natural Gas Company and Utah Natural Gas Company, has indicated that he is hopeful that Utah will be developed into a significant gas producing area. Utah Natural Gas Company has a subsidiary company, Utah Western Pipe Line Company, which will export gas to increase service to California should the reserves in Utah prove adequate to justify this export. Kayser has made it clear, however, that the needs of the producing state, Utah, will be fully satisfied before exportation of gas is proposed.

El Paso Natural Gas Company in an effort to develop gas reserves in Utah has established a Geological and Land Department in Salt Lake City under the jurisdiction of Warren Taylor. The members of this staff are engaged in the exploration for gas and the acquisition of additional acreage for exploration. Kayser has announced that he feels the long-range interest of consumers demands that the pipe line companies own a substantial portion of the reserves dedicated to the people which the pipe line company serves.

The completion of the 63.5 mile transmission line of Utah Natural Gas Company represents a significant accomplishment in the pipe line industry. Although the line is short, the sheer ups and downs of that line, the unusual altitudes, the very difficult winter climate, and the isolation of most of the facilities make it into a very challenging undertaking.

—The End

# Finishes what it starts

From site preparation to final clean-up, no single piece of equipment is as useful as a Caterpillar D6 Tractor equipped with a No. 6A Bulldozer.

"We use Cat* machines from 'the cradle to the grave'," says Lyle Ostrander. "Since we bought our first piece of Caterpillar equipment 15 years ago, we have tried to standardize on them."

Mr. Ostrander is pipe-laying foreman for Otis Eastern Service, Inc., Wellsville, N. Y. The company's handy, rugged D6 is shown filling around valve boxes after a drill rig has been moved at Lock Haven, Pa.

The D6, equipped with a bulldozer and a Hyster 6N Winch, is used by Otis Service to lay pipe, clear out for locations, and for cleaning up after drilling and abandoning wells.

The talented Cat angling-type Bulldozer is master of any job it tackles. Deftly taking large loads, it holds them on the blade and puts them where needed. The blade, sturdily built of five box sections, can be angled into three positions by one man.

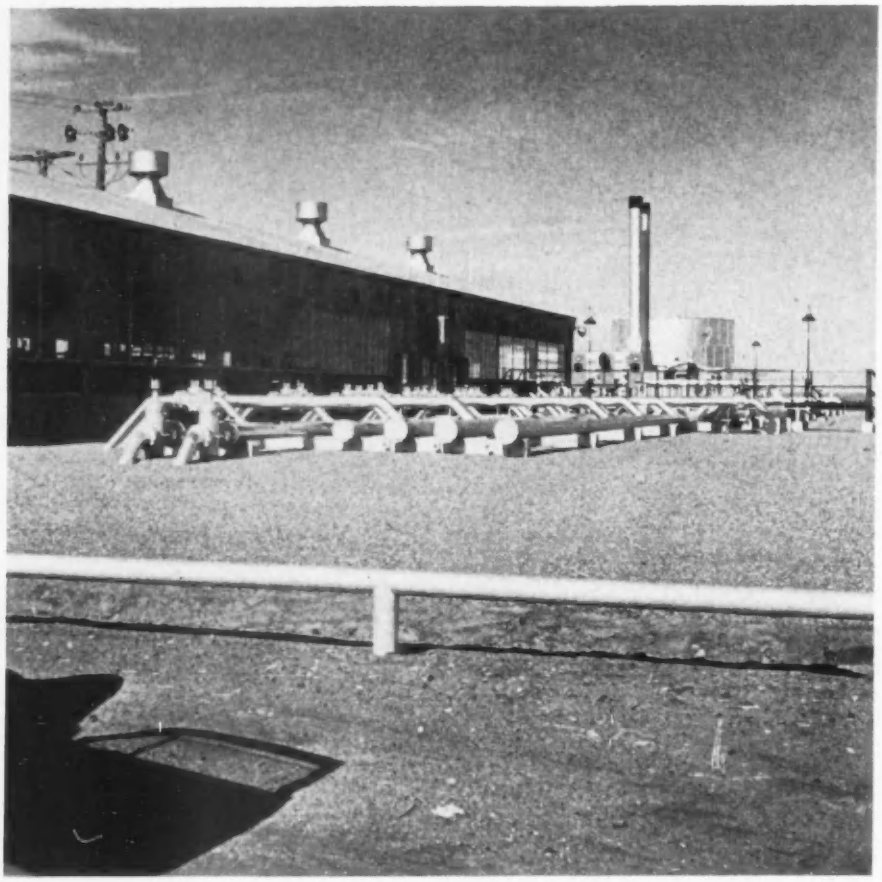
Your Caterpillar Dealer will be happy to give you a demonstration of this versatile big yellow rig. You'll find there's real profit in Caterpillar yellow.

Caterpillar Tractor Co., Peoria, Illinois.

**CATERPILLAR***

*Both Cat and Caterpillar are registered trademarks—®

**NAME THE DATE... YOUR DEALER WILL DEMONSTRATE**



**JUNCTION PUMP STATION** of Union Oil Company of California has three incoming and three outgoing lines. The station is located at an isolated point in San Joaquin Valley.

# From 40 Miles in 1886 . . . To 1183 Miles Today

**That's the story of Union Oil Company of California's pipe line network. The company's three systems date back to the world's first crude pipe line from producing wells to tidewater.**

THE WORLD'S FIRST crude oil pipe line from producing wells to tide water was built in 1886, by a predecessor company of today's Union Oil Company of California. From this 40-mile, 4-inch crude line, Union's system has expanded to a network of 1183 miles of line and 23 pump stations handling 85 million barrels of crude oil and products a year.

The company's system is organized in three divisions—Northern, Southern, and Ventura, all carrying crude oil; there is also a products and natural gasoline line system in metropolitan Los Angeles.

Peculiar to Union's pipe line operations is the fact that crude oils of widely varying gravities must be handled. The range is from 6° API to 42° API and higher. One line, for example, handles 4000 barrels daily of 11° API gravity crude with a viscosity of 1000 SSF at 122° F. The heavy crude moved through other lines is heated so it can be moved more easily. These severe conditions, plus the many years of operations, help explain why Union Oil's pipe line operators are considered to be experts in the handling of special situations.

Since the Los Angeles Basin oil fields are in or near heavily populated districts, pipe line construction, maintenance and operation presents problems not usually found in oil fields. The acquisition of rights of way is expensive and often difficult, and safety measures all along the pipe line's path are doubled and redoubled to avoid fire and explosion hazards.

**Long-Range Program.** Recently, Union Oil has started on a long-range program to replace its obsolete steam-powered pump stations. Two of these have been equipped with the latest diesel-engine driven pumps, using heavy crude as a fuel.

The latest conversion was the 42-year-old Junction Pump Station on Union's northern division, San Joaquin valley pipe line. It is located midway between Taft and Coalinga, Calif., a good 70-mile haulage from any convenient diesel fuel-oil cache. Trucking-in diesel fuel was bound to be expensive and tedious. Happily, Union's engineers had an answer—thanks to four years of testing and two smaller conversions. That answer was to put diesels on a diet of crude.

Economies—and the convenience of crude-fueling diesel pump engines—are noteworthy. Where standard diesel fuel costs about $5.20 a barrel, Junction's engines get along nicely on crude which has a posted value of $1.80 a barrel. Currently the company saves some $42 a day what with its diesels consuming approximately 12 barrels during a 24-hour run. Heavy 46-degree API crude is the fuel.

**Other Features.** Crude-fueled engines are but a few of the features incorporated in this, the third and largest steam-to-diesel conversion along Union's nothern division pipe line. Some others: (1) easier to handle, easier to maintain above-ground manifolding; (2) centralized console monitoring station: (3) intra-station piping concealed in the steel-plate-covered trenches; (4) air clutching between diesel engines and the quintuplex plunger pumps they drive; (5) built-in fire protection because of the station's isolation; (6) special filtra-

# How SUNRAY OIL boosts pipe line capacity 25%

Three years ago production skyrocketed at the Sunray Oil Corporation refineries in Duncan and Allen, Okla. Expansion throughout the system overloaded the 8-inch pipe line between the two cities. Bigger pipe was not available.

Sunray engineers hit on a cost-cutting solution—installed three electrically powered booster stations between regular pumping stations. They know that electric motors cost less to install . . . require little maintenance . . . are easily adapted to remote control circuits.

Then engineers selected an RCA 960-mc Microwave radio-relay system to effect complete remote control of the *"boosters"* from regular pumping stations. Microwave stations spaced miles apart proved cheaper to install and maintain than direct wire. And Microwave systems are virtually weatherproof.

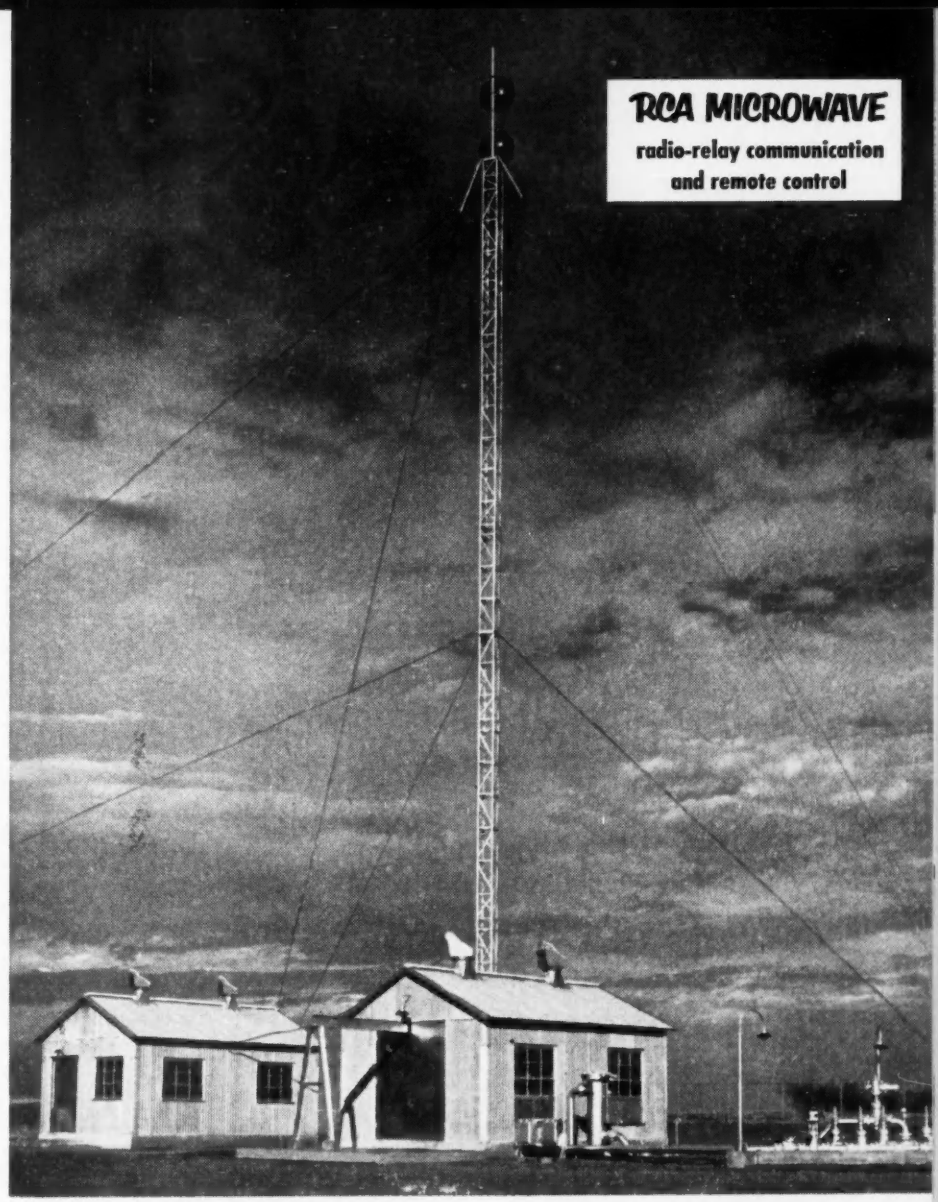
When the Sunray microwave-operated *"boosters"* were put in operation on January 31, 1952, *the pipe line's capacity immediately increased 25 per cent!*

RCA Microwave "beams" highly directional radio signals from station to station by "dish" antennas. Since 1946 RCA has installed many fully reliable Microwave systems, some over 1,000 miles long. *All have proved themselves in performance*—for utilities, government agencies, telegraph companies, turnpikes, as well as pipe lines.

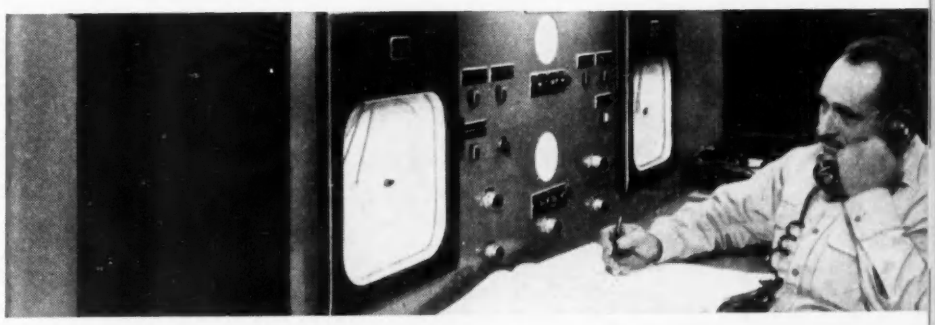
In addition to remote control and supervisory functions, RCA Microwave provides as many voice and teletype channels as you need—and does it with a minimum of frequency space. It employs readily available tubes and familiar circuits which are easy to service. It interconnects with your telephone lines and switchboards.

If you desire, RCA supervises survey, construction and installation—offers a complete single-source, single-responsibility service. And only RCA can provide the nationwide service facilities of the RCA Service Company.

**For more information, mail the coupon ▶**




**Unattended booster station** at Pernell, Okla. Radio-beam signals via RCA Microwave operate the booster by full remote control. Maintenance man inspects each station once every 24 hours.



**Telemeter charts** give continuous record of power and pressures at boosters. Operator remote-controls valves and pumps of booster stations. Signal lights indicate equipment failure and emergency generator operation. 2-way voice channel contacts maintenance personnel.

**RADIO CORPORATION of AMERICA**
COMMUNICATIONS EQUIPMENT — CAMDEN, N. J.

Dept. 252X, Building 15-1
Without obligation on my part, please send me your free booklet on:

☐ A Booster Station Microwave System ☐ Pushbutton Operation of Boosters

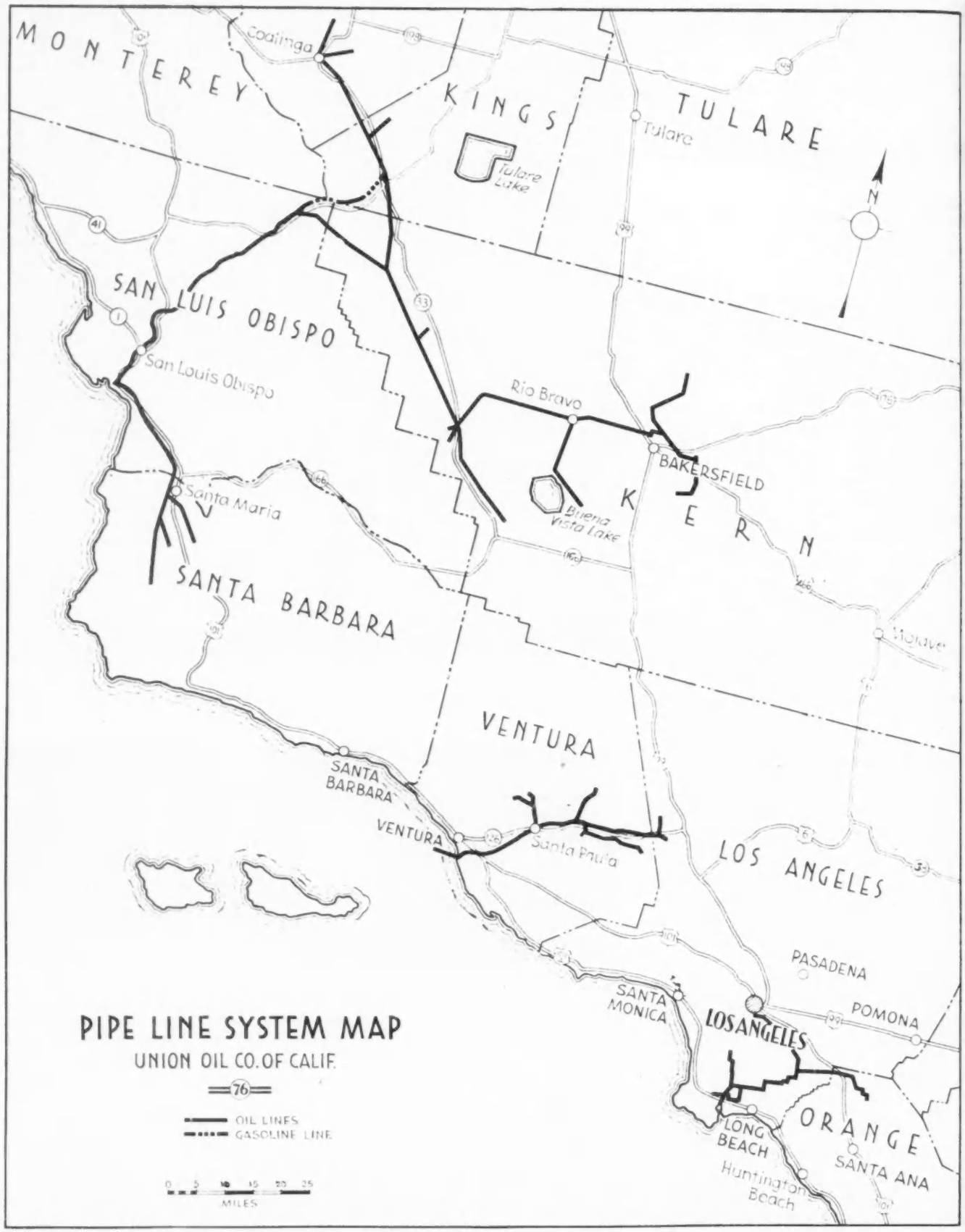
Name_____ Title_____ Company_____

Address_____ City_____ Zone____ State_____

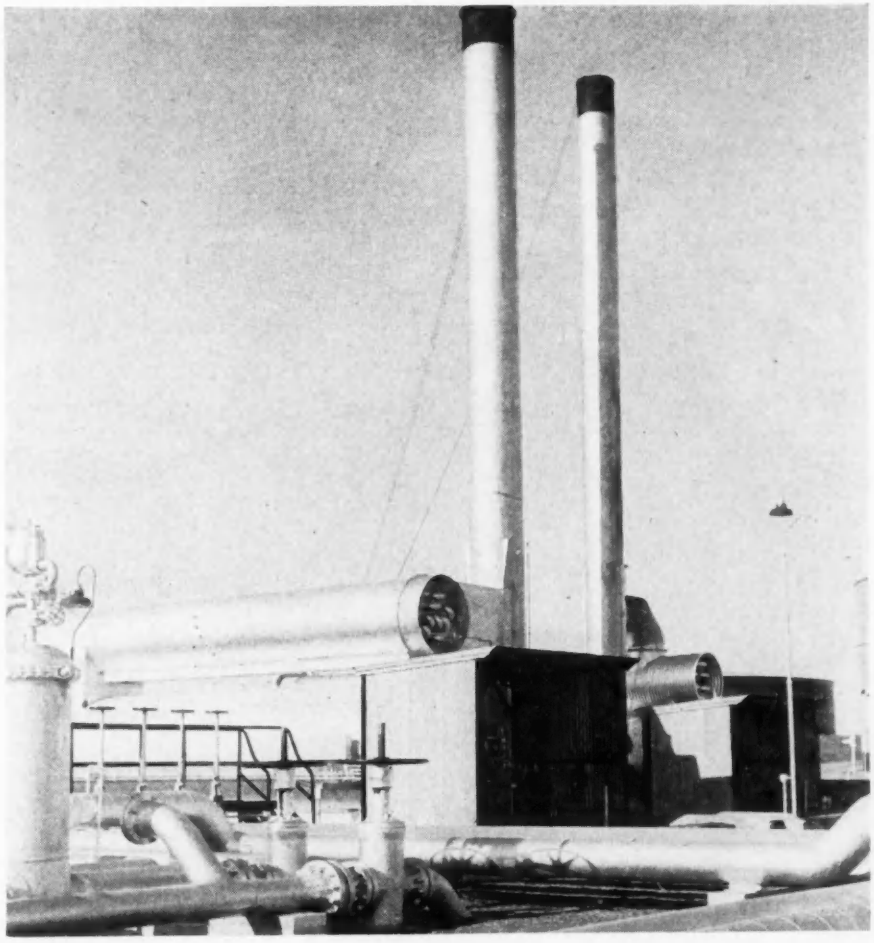
☐ Have an RCA representative get in touch with me.

# Map of the Month

## Union Oil Company of California



**DIRECT FIRED HEATERS** burning crude oil at Junction station heat the heavy pipe line crude before it is boosted to stations downstream.



tion system cleansing crude that's destined for diesel fuel.

Here is an analysis of the crude used as fuel:

| | |
|---|---|
| Gravity, degrees-API | 15.7 |
| Flashpoint, °F. (closed cup) | 178.0 |
| Pour point °F. | 30.0 |
| Viscosity: | |
| SSF @ 70° F. | 1180 |
| SSU @ 100° F. | 2468 |
| SSU @ 130° F. | 763 |
| Carbon residue, wgt. % | 5.93 |
| Ash content, wgt. % | 0.04 |
| Sulfur, wgt. % | 1.15 |
| BS&W as rec'd, vol. % | 1.00 |

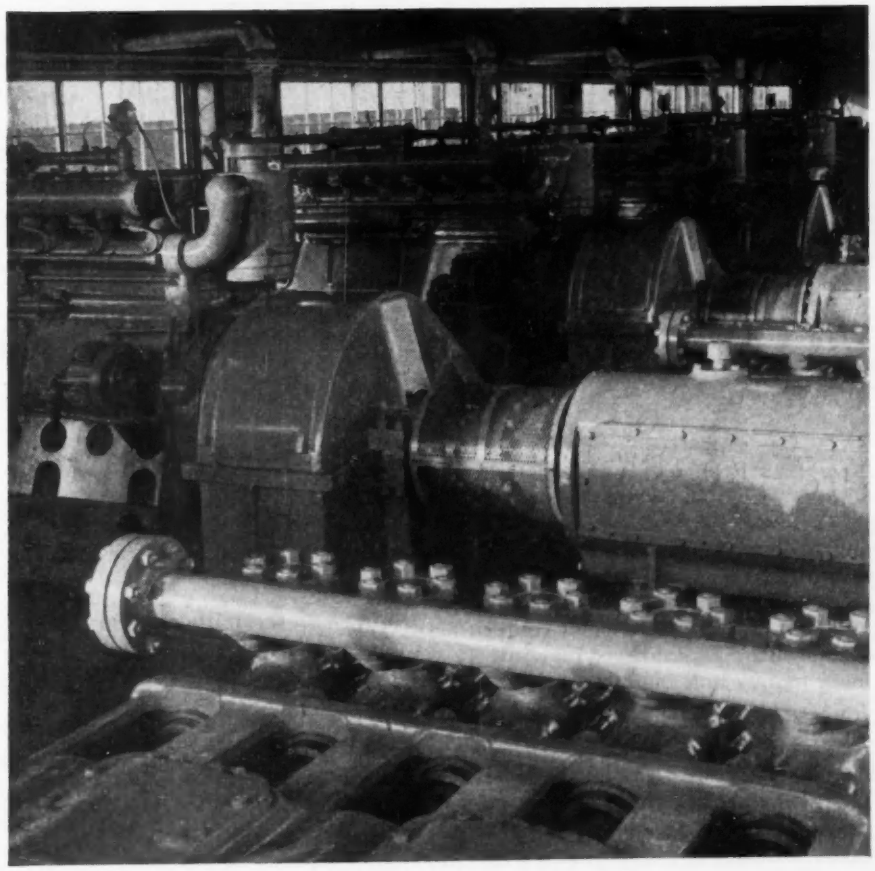
Of course, the crude must be filtered and heated before it is used in the engine's injectors. And even then, diesel fuel must still be used during the first 15 minutes of an engine's warm-up and during the last 15 minutes before shutting down.

Should crude not be purged from the engine system, and should it cool, it would be necessary to dismantle and clean fuel lines and injector pumps.

The 1800-barrel crude-fuel tank pump-fills a 200-barrel elevated day tank, which in turn gravity feeds the diesels' injector systems.

**How Filters Work.** In series with the elevated day tank are four water-jacketed, cloth-packed filters. Heaters in the filters are supplied by the engines' water jacket systems, so manifolded that all engines on the line contribute. Crude from the day tank is pumped around this four-filter circuit by a one horsepower electrically-driven pump. The pump's rating is 20 gallons per minute, some ten times the maximum 2-gallon per minute consumption of the diesels when all six are operating.

Thus, ten times as much crude is constantly and continuously being filtered and refiltered as is actually used. It takes but a relatively short time for the day tank's crude to be cleansed of all but 1/10 of 1 percent of its contaminants—this from an original approx. 3 percent contamination. The



**STATION INTERIOR** at Junction shows new 216-horsepower diesels with air clutches connecting them to quintuplex pumps.

# 35,000 miles of A. O. Smith line pipe!

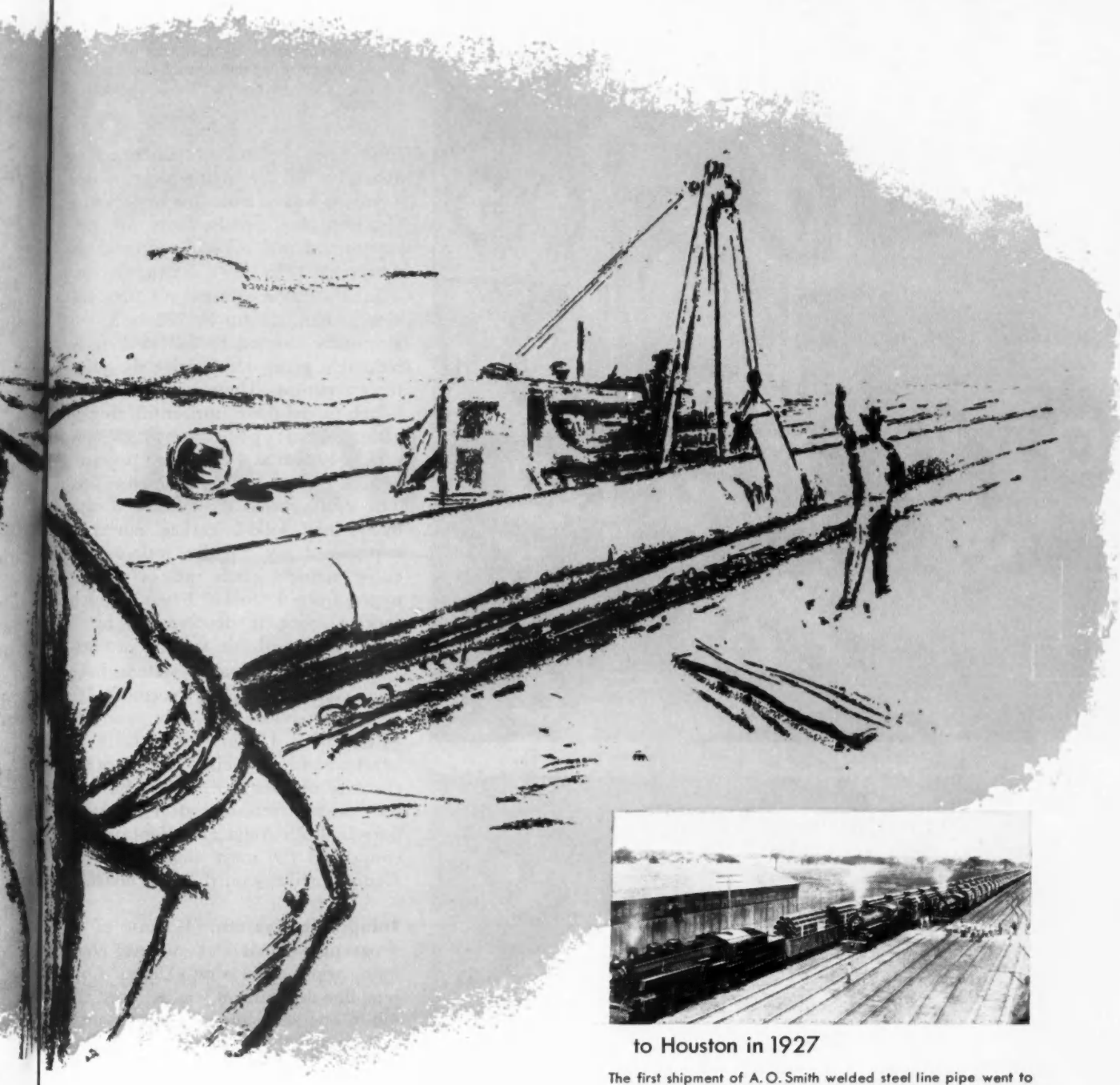
**Pipe line contractors** have laid 35,000 miles of A. O. Smith line pipe! They have assembled, welded and lowered in 5,263,549 tons of it, spanning mountains, deserts, forests, rivers and swamps, as well as rolling and flat farm lands. A herculean task, well done, that taxed ingenuity, men, money and machinery!

**It all started in 1927** when A. O. Smith engineers developed and produced the first resistance-welded, large-diameter, thin-wall, high-strength steel pipe that virtually overnight launched a new industry! From it grew today's vast network of long distance pipe lines that transport natural gas, crude oil and refined products from one end of the country to the other.

**The new A. O. Smith process** meant hundreds of miles of large diameter pipe could be produced in weeks instead of years. More pipe lines could be built. Pipe could be supplied for more than one line at a time. This opened the field to more contractors who absorbed new millions of dollars of welding and construction equipment.

**There has been no letup** in our production. In 1950 we opened a new mill in Houston, with Sheffield Steel Corp., Houston, as our partner, to supplement Milwaukee plant production. Both of these mills produce identical quality pipe, flash-welded and internally expanded to meet the rigid requirements of strength and trueness which the industry demands. This means we are in position to keep big pipe line programs rolling.

*A. O. Smith Line Pipe is available in a complete range of sizes and wall thicknesses, from 8⅝-in. to 36-in. diameters.*





to Houston in 1927

The first shipment of A. O. Smith welded steel line pipe went to the Dixie Gulf Gas Company for construction of a gas line from Waskom to Houston and Port Arthur. The Milwaukee mill, today, has a capacity of 300 miles per month.

from Houston in 1953

Since 1950, A. O. Smith line pipe has also been shipped out of Houston. The A. O. Smith Corporation of Texas mill has a monthly capacity of 200 miles.

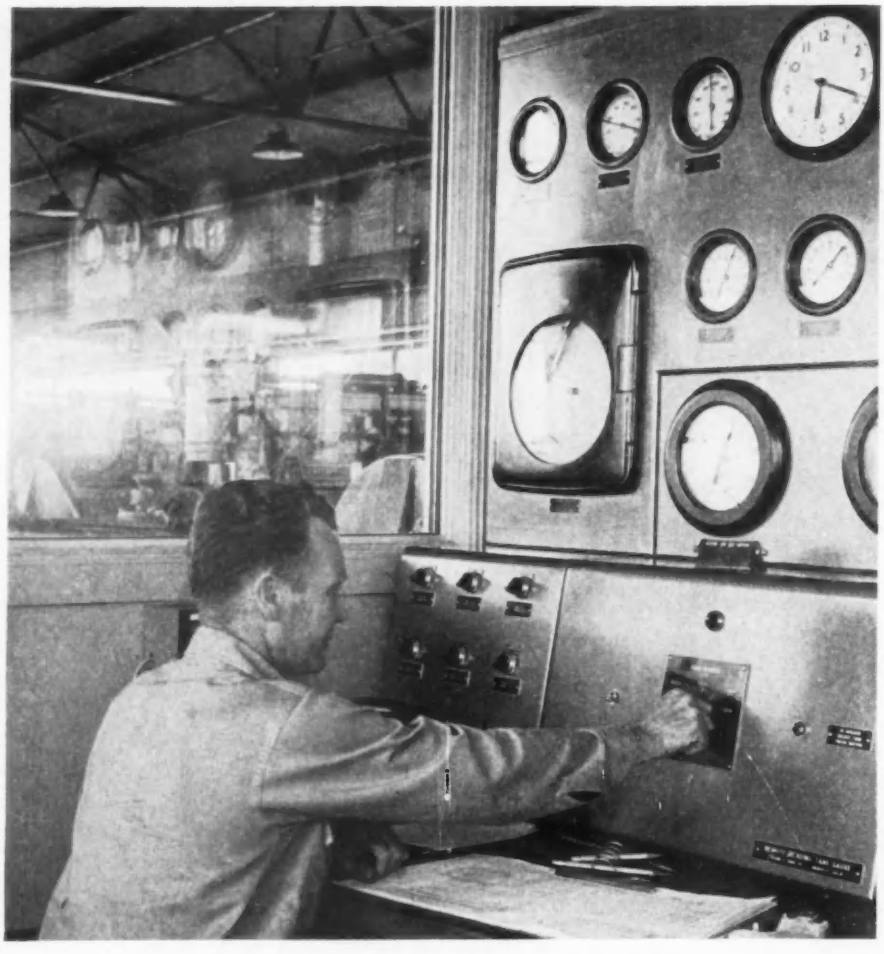
PROGRESS through RESEARCH and ENGINEERING

A. O. Smith CORPORATION

LINE PIPE • CASING

Chicago 4 • Dallas 2 • Denver 2 • Houston 2 • Los Angeles 22
Midland 5, Texas • New Orleans 12 • New York 17 • Pittsburgh 19
San Francisco 4 • Seattle 1 • Tulsa 3 • Washington 6, D.C.

*International Division: Milwaukee 1*



**ONE OPERATION.** Console centralizes gauging, recording, and switching to a single operating room in center of pump house. Windows are soundproof and double-paned.

four heater filters—maintained at about 160° F. by engine jacket water—are graduated from fine to very fine filtration. And finally, there are two super-fine filters at each engine which remove particles down to five microns.

In operation, Junction's six engines, rated 216 hp at 720 rpm, are air-clutch coupled to 5.8 to 1 ratio reduction gears which drive six quintuplex pumps. These are 5-inch by 8-inch model 558P horizontal, single-acting, quintuplex plunger pumps rated 540 bph at a discharge pressure of 1200 pounds per square inch gauge. The crude-fueled diesels are 8-inch by 10-inch solid-injection, normally aspirated, six cylinder, four-stroke-cycle engines. Their ratings can be upped from 80 to 120 bmep through supercharging to develop 324 hp if future increased line loading justifies.

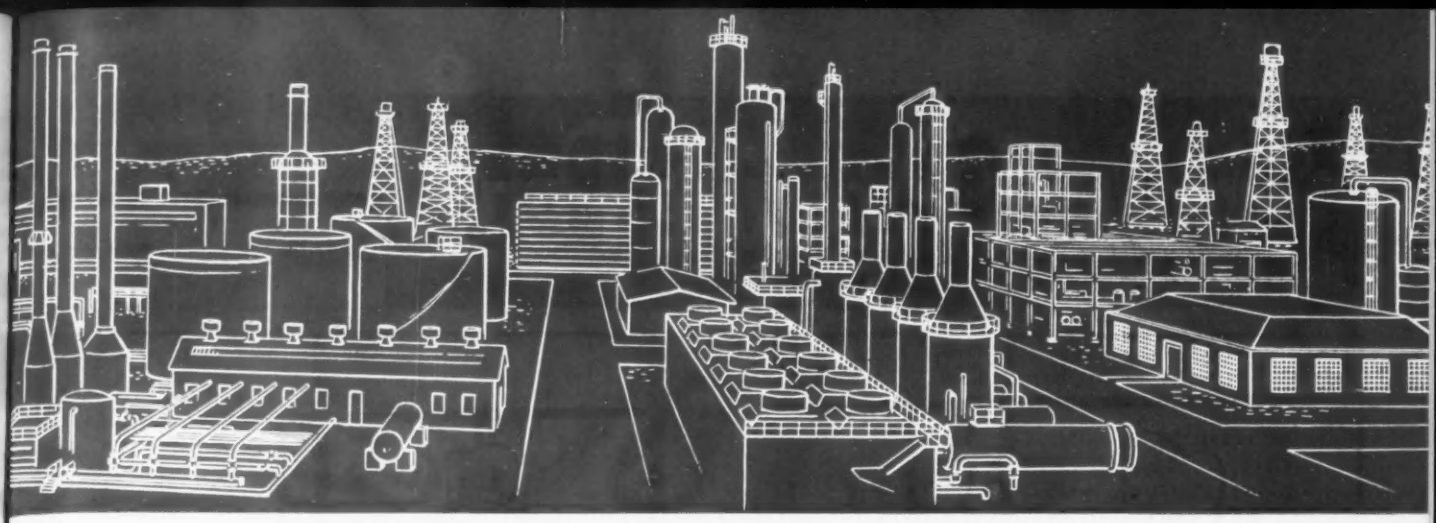
Two of the company's systems have tide water outlets. The Northern Division terminates at Avila, and together with Union's tank farm at nearby San Luis Obispo has a storage capacity of over five million barrels; the Ventura terminal stores 225,000 barrels. Both Avila and Ventura are considered the most modern marine loading facilities on the west coast.

**Telephone System.** Because of its geographic extent and resultant communications problems, Union Oil's pipe line department was assigned the job of operating the entire company's private telephone system. Consisting of 2502 miles of voice channels, seven automatic exchanges and 1650 telephones, the system handles an average of 78,000 calls a month. This network, one of the largest private telephone systems in the country, permits company people anywhere in Southern California to talk with each other at the turn of a dial.

Union Oil Company's pipe line system has progressed far since 1886, but its growing days are not yet over. New mileage is being added as new oil fields are discovered, and as highway transport gets more costly.

**—The End.**

**MANIFOLDING** at Junction station with direct-fired heaters in the background.



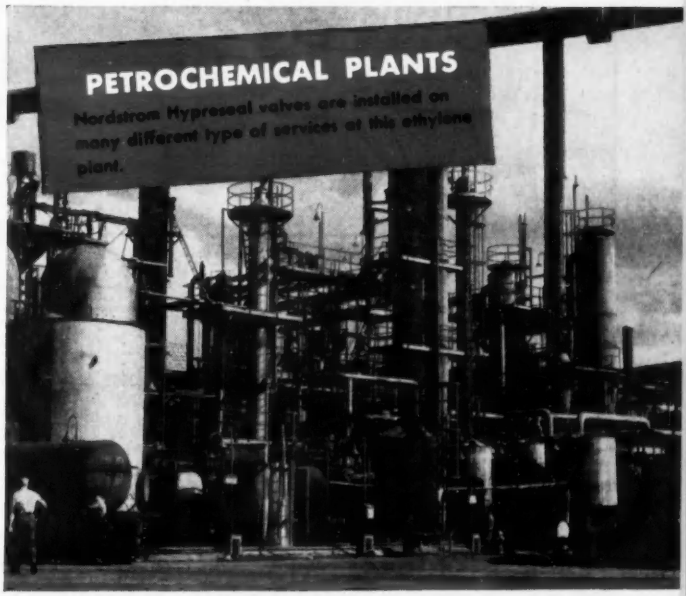
# The Oil Industry...
## FROM WELL TO CONSUMER

Rockwell products have proven their efficiency in hundreds of applications throughout the Oil Industry.

Nordstrom Lubricant-Sealed valves, Rockwell Rotocycle meters, and Rockwell Industrial meters are in operation on all types of Oil Industry services requiring accurate measurement and control.

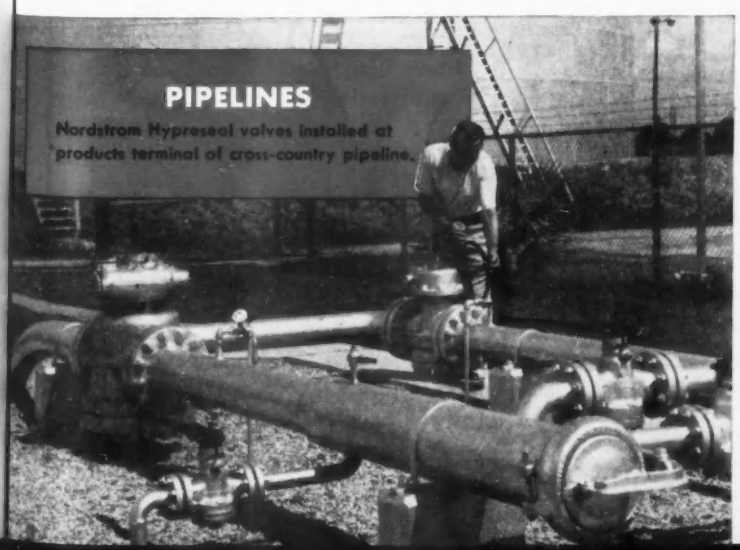
For further information on any Rockwell product, call your nearest Rockwell representative or write: Rockwell Manufacturing Company, Pittsburgh 8, Pa.

*In Canada, Peacock Brothers Limited.*

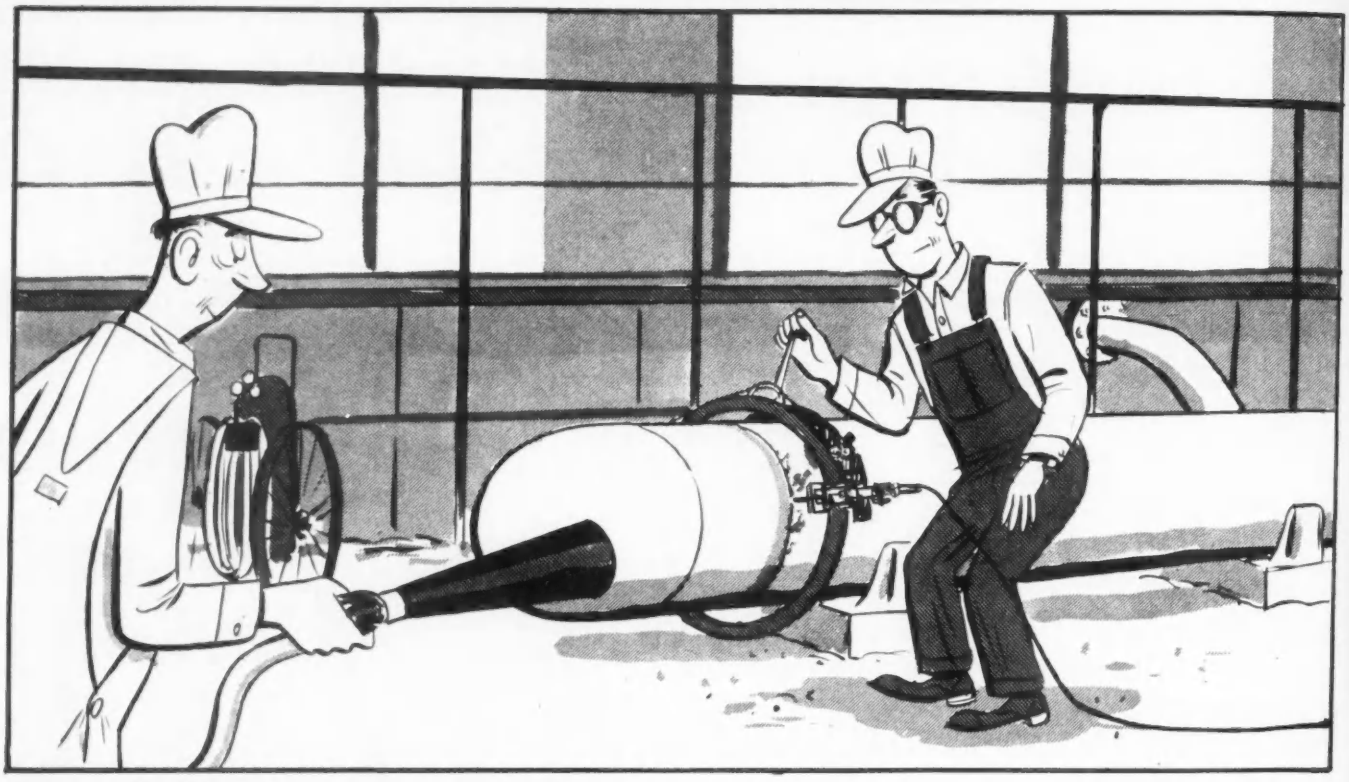

PETROCHEMICAL PLANTS
Nordstrom Hypreseal valves are installed on many different type of services at this ethylene plant.

**ROCKWELL MANUFACTURING COMPANY**

**PITTSBURGH 8, PA.** Atlanta Boston Chicago Houston Los Angeles N. Kansas City New York Pittsburgh San Francisco Seattle Tulsa



# Perils of Pipeline Pete

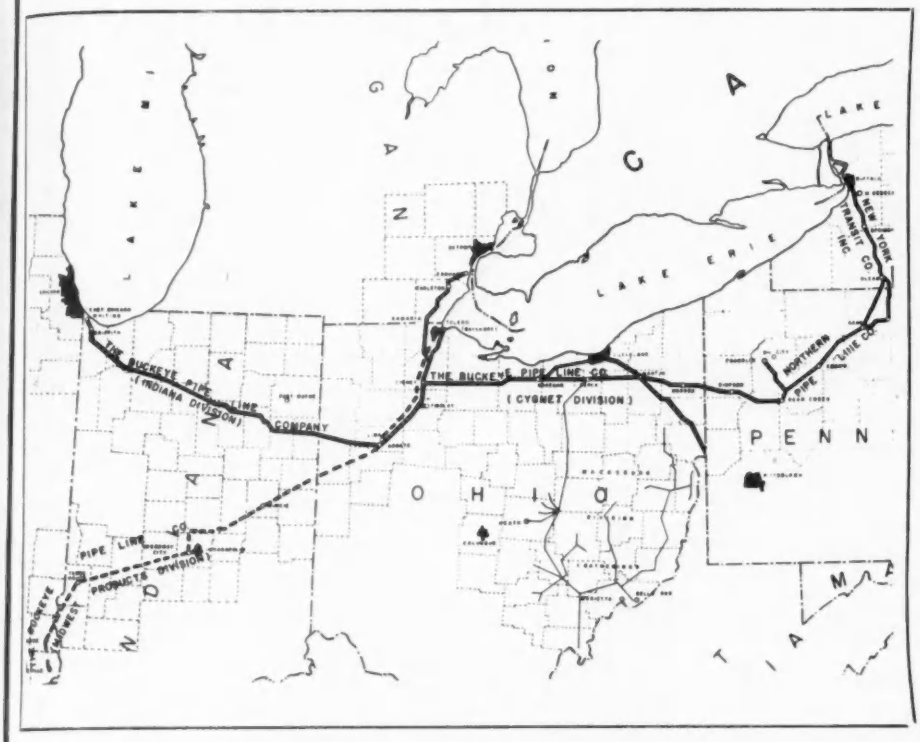


A tower of safety—Pete was on guard . . .

. . . he pressed on the button—but the chemical was hard

# WHAT'S HAPPENING
# IN PIPE LINE CONSTRUCTION

By **MARY STUART WARREN,** WORLD OIL Staff




**BUCKEYE PIPE LINE COMPANY** has announced purchase of the Transit and Storage Company's pipe line properties in Ohio and Michigan consisting of crude oil pipe lines, pump stations and tankage extending some 150 miles from Cygnet, Ohio, through Michigan to the Canadian-United States International Boundary. The lines have been used to supply Imperial Oil Company's refinery at Sarnia, Ontario, with United States crude.

## Collins Construction Has Job in India and Africa

Taylor-Woodrow, Ltd. (West Africa) has completed negotiations with Collins Construction Company of Port Lavaca, Texas, to furnish marine equipment for an 11,500-foot, 12⅝-inch submarine crossing at Accra on the Gold Coast of Africa. The work is being done for Socony Vacuum, Inc. of West Africa.

Collins will furnish launchways and floatation equipment that will enable pipeliners to launch pipe directly into heavy surf. This equipment is the same used by Collins in the successful launching and completion of the four-mile crossings of the Straits of Mackinac (October WORLD OIL).

Collins is also furnishing technicians and equipment for Merritt-Chapman & Scott in Bombay, India. This job which is being done for the Bombay Port Trust calls for the laying of approximately 84,000 feet of underwater line ranging from 8 to 24 inches. There are 7 lines which will run from Butcher Island to the mainland. Three of the lines will carry crude to inland refineries; three others will carry refined products to the loading terminal on the island; and one of the lines is an eight-inch fresh water line.

All of the lines in Bombay will be lowered by the Collins underwater trenching machine which was used to lower Transcontinental Gas Pipe Line Corporation's Hudson River crossing in upper New York Harbor.

## 70,000 Feet of 30-Inch Line Underway in Lake Maracaibo

Tellepsen Construction Company of Houston has started construction of 70,000 feet of 30-inch, 26-inch and 24-inch pipe to be laid in the 50 to 90 foot deep water on Lake Maracaibo, in Venezuela. The line is being constructed for Creole Petroleum Company as part of the gigantic pressure maintenance program for this South American field.

In all, there are 72,000 feet of pipe including 7000 feet of 26-inch and 5000 feet of 24-inch. All of it will be laid 7½ miles or more from shore to form a giant loop of pipe which will furnish suction for an offshore compressor station.

Tellepsen has completed a launchway upon which 2500 foot sections of the line will be welded up and coated with 4¼ inches of concrete. Then it will be loaded onto mine trucks and shoved into the lake. As the pipe is launched, pontoons will be attached and tugs will pull the 2500 foot section to the permanent position in the lake.

After the 2500-foot sections are in place, they will be tied in on a work barge. E. A. Kruse will supervise the job from Houston, and J. C. Coultrup has charge of field work.

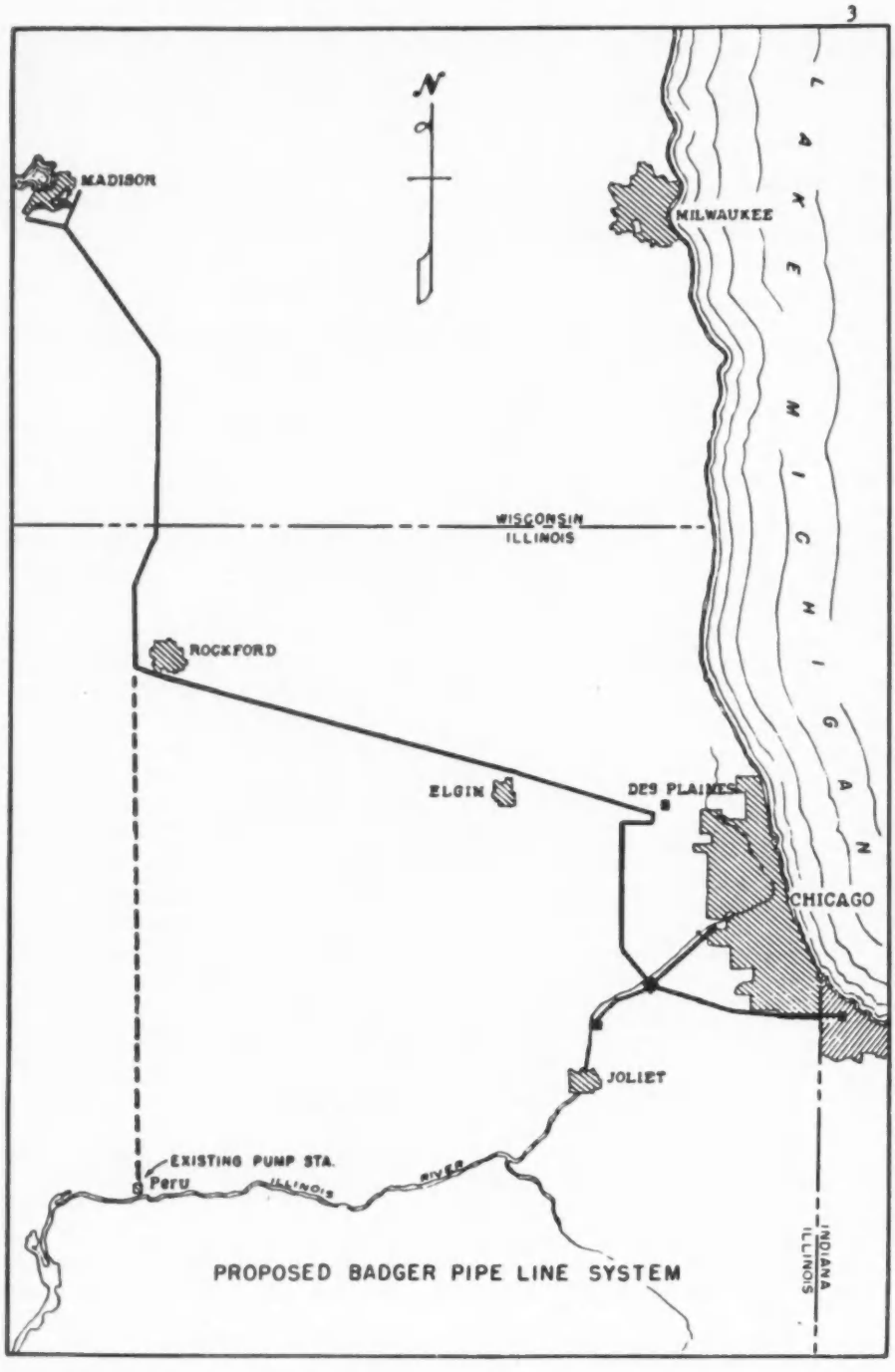
Plans call for launching to commence about January 1.

## Gas Company Revenues Exceed 2 Billion in 1952

Gas operating revenues of 150 natural gas companies filing annual reports with the Federal Power Commission totaled $2,277,316,000 for 1952 and sales of natural gas by the companies amounted to 7.64 trillion cubic feet.

Companies who derive a high proportion of the operating income from other than natural gas operations are excluded from the comparative data. Sales of natural gas and revenues from such sales reported by predominately natural gas companies for 1952 amounted to 7.10 trillion cubic feet and $1.9 billion, representing increases of 9.7 percent in sales and 17.7 percent in revenues, over sales of 6.47 trillion cubic feet and revenues of $1.6 billion in 1951.

Service was supplied to an average of 7,270,000 customers during 1952 compared to an average of 6,837,000




**BADGER PIPE LINE COMPANY's** proposed pipe line system extending from Chicago to Madison, Wis., will give Wisconsin its first petroleum products pipe line. Owned jointly by Cities Service Oil Company, Sinclair Pipe Line Company, The Pure Oil Company, and The Texas Company, the line will consist of 197 miles of 12-inch line and 18 miles of 10-inch line.

during 1951, an increase of 6.3 percent. During 1952, 65.2 cents of the revenue dollar went for operating expenses, including the cost of purchased gas, 8.3 cents for depreciation, 7.2 cents for federal taxes on income, and 4.8 cents for other federal and state and local taxes.

## Interprovincial Completes Superior to Sarnia Extension

Interprovincial Pipe Line Company has completed its 645-mile extension from Superior, Wis., to Sarnia, Ontario, a construction job which took only five months to complete.

The project consists of 30-inch line pipe, the largest size pipe used for the transportation of crude oil in North America. The entire pipe line from Edmonton, Alberta, to Sarnia is 1765 miles and makes Interprovincial's the longest crude oil pipe line in the world. Ultimate capacity of the new section is 300,000 barrels per day. The completion of this line makes possible transporting Western Canadian crude direct to Sarnia refineries on a year around basis, thus avoiding the present transportation shutdown during the closed navigation season.

The construction of the pipe line through Michigan included the successful laying of the crude line across the Straits of Mackinac where the line lies in 250 feet of water. The entire line is now undergoing testing, and although the line is completely welded, it will be another month before oil reaches Sarnia.

## Construction Progresses On Yellowstone Pipe Line

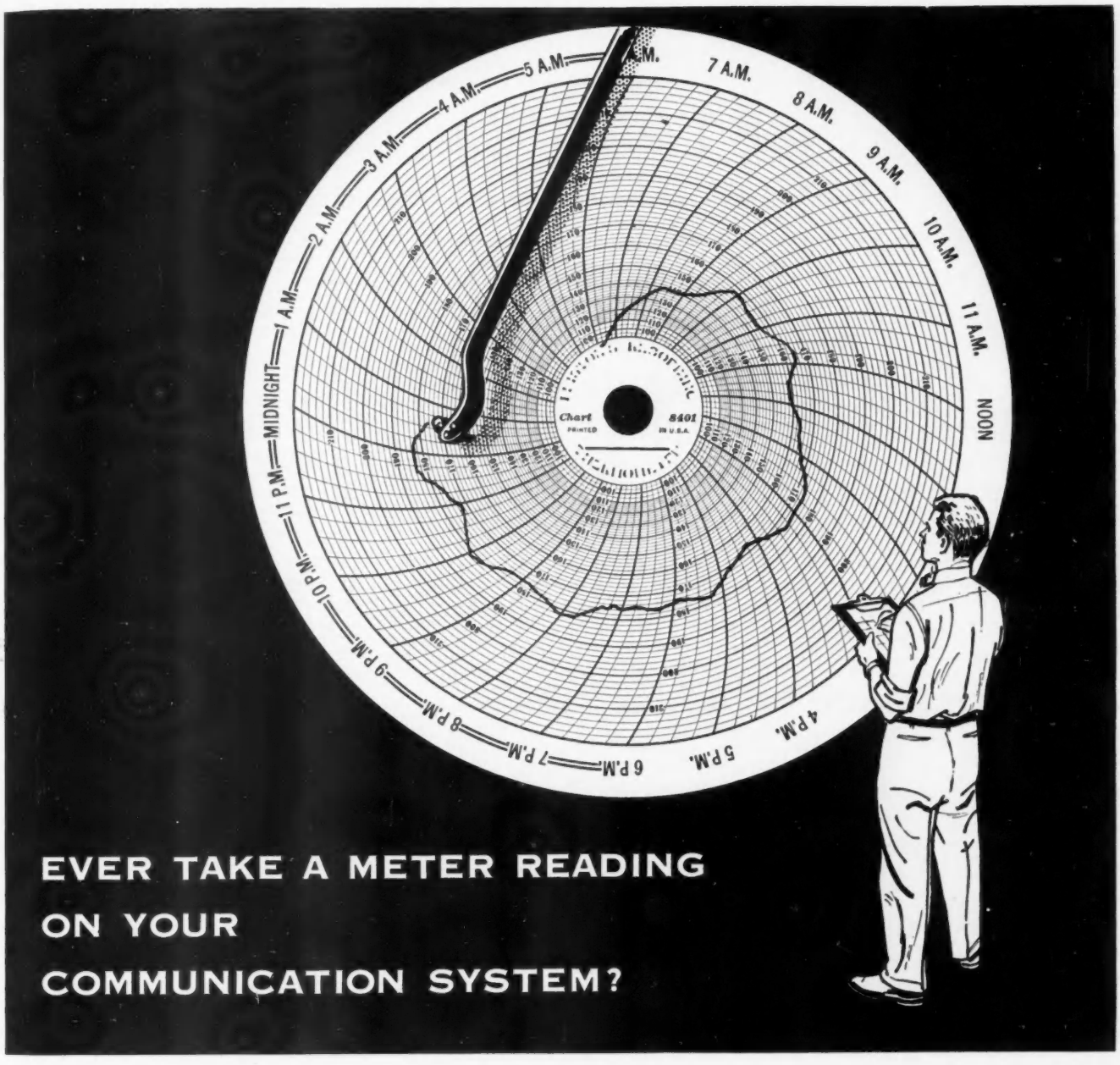
Good weather has enabled pipeliners to get off to a good start in constructing the Yellowstone Pipe Line System in Montana from Billings, Mont., to Spokane for Continental Pipe Line Company. To date more than 50 miles have been completed.

Contracts were let to four contractors for construction of the line. Ross and Powers Construction Company of Billings, Mont., will construct the section from Billings to Bozeman, Mont.; Associated Pipe Line Contractors of Houston, the section from Bozeman to Clinton, Mont.; Eastern Pipe Line Contractors of Dallas, from Clinton to Murray, Idaho; and Engineers Limited Pipe Line Company of Denver, from Murray to Spokane.

On November 15 Continental reported 530 miles surveyed and mapped, 429 miles of pipe on hand, 166 miles of right-of-way cleared, 83 miles of ditching completed, 72 miles of pipe welded, 62 miles lowered into the ditch, and more than 50 miles completed.

Plans call for the job to shut down during December and January because of anticipated inclement weather. Work will continue in February or March and the line is scheduled for completion by summer of 1954.

Ownership of the line will be shared by Continental, Interstate Oil Pipe Line Company, Union Oil Company of California and the H. Earl Clack interests.




# EVER TAKE A METER READING ON YOUR COMMUNICATION SYSTEM?

Bell System communication engineers will help you take a good, close look at your communication system . . . *at no cost to you.*

Your Bell Telephone Company will make a comprehensive survey to help you get the best use of your facilities . . . local exchange, long distance, mobile, teletypewriter, metering and supervisory control . . . all the communications you use. More than one hundred studies are now underway for major pipe lines, power companies and railroads.

These surveys include recommendations to give your operation the best communications at the lowest possible costs. Many companies have changed, rearranged or added services on the basis of these surveys.

**• If you are interested in a communication survey by Bell System experts without charge, call your local Bell Telephone representative now.**

PRIVATE-LINE TELEPHONE

TELETYPEWRITER

MOBILE TELEPHONE

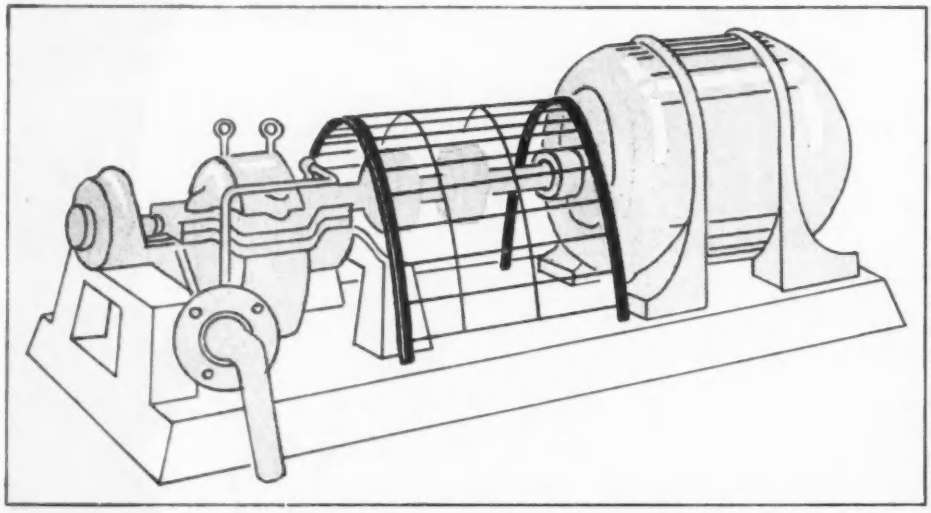
METERING CHANNELS

BELL TELEPHONE SYSTEM

# How to do it

## PIPE LINE HINTS

**$10 is paid for each illustrated acceptable contribution. Mail to The Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas.**



## Making a Guard for a Pump Shaft

Place a simple guard over a pump shaft and perhaps save a life. The guard will take only an hour or so to make, and little or no time to install—yet it could be the most important guard in the world to an operator, oiler or visitor.

To make the guard, simply weld two-inch by six-inch wire mesh of No. 5 gauge, which is usually available in flat sheets of three feet by five feet to a light circular frame of strap steel. Using ordinary bolt cutters, trim the mesh to the proper length to fit the shaft.

Then bend two pieces of one-inch strap steel to a semi-circular shape which will go over the top of the shaft with ample clearance. Heat the ends of the strap and bend an inch or so outward to make "feet" for the guard. Then weld the mesh to the strap steel.

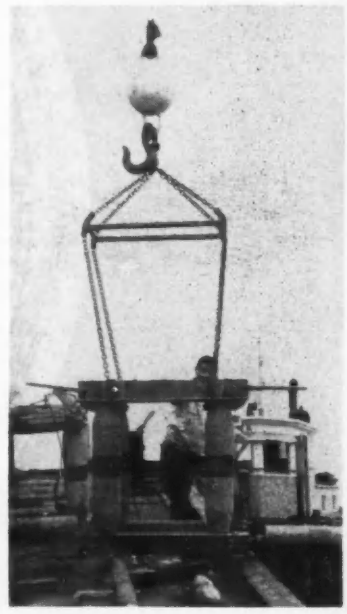
Bolt the guard to the pump frame; or if the shaft extends over the concrete base, use a star bit to drill holes for expansion shields and bolt the guard to the concrete foundation.

## Carting Equipment

If there is a need to make acetylene welding and cutting equipment portable, the cart shown will do the job. Although designed primarily for moving the cylinders around the shop, it could easily be used to carry the cylinders out to the job in the field.

The frame is made of 2-inch angle iron welded together so that three rectangular openings are formed. Over each of the outside openings, supports are made from angle iron and sheet metal for the oxygen and acetylene cylinders. A section of grating placed in the center opening of the frame makes a walkway wide enough for a man to walk between the cylinders. The 6-inch rubber-tired wheels and

their assemblies are welded to ½-inch plates, six inches square, in each corner of the frame. The tongue of the cart is made of scrap iron and pipe.



## Rolling River Clamps

River clamps, cast in the shape of rollers, can be easily adjusted and moved after the pipe is in the water. If construction conditions permit, they can be linked together with wire rope and pulled into position in gangs when the pipe is in the ditch.

They will slip over the pipe and can be latched. This makes them easier to install than conventional clamps. They can be installed at a remarkable clip under water, since the bottom opens up and all the diver has to do is latch them. There are no bolts to make up under water.

Once the pipe is down in the ditch, they keep their position as well as conventional clamps.

To make these clamps, simply cast the cast iron weight in the shape of rollers with spindles. Then mount them in a steel frame as shown in the accompanying photograph. Note that the bottom weights can swing outward, as shown. To install them, the diver simply has to swing the weight back into the frame and drop in a locking bolt.

To prevent damage to the coating, wrap neoprene around the rollers at the contact points.

Oil Painting by Tom Hill especially for Barrett Division

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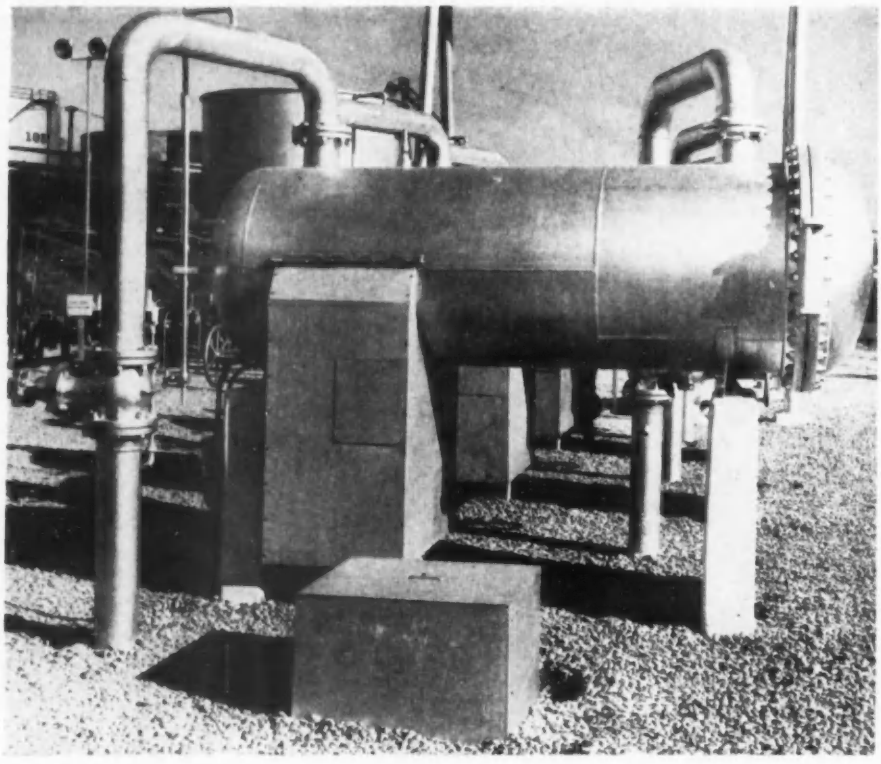


## Protecting Water Leg on Separator

A galvanized sheet metal box lined with fiber insulation will protect the water leg and gauge glasses on a separator. The box is made to clip right onto a bracket on sides of the separator.

A small door on the side of the box enables operators to check gauge glasses and operate bleed-off valves. Operators can easily remove the door by loosening two screws on the lower side.

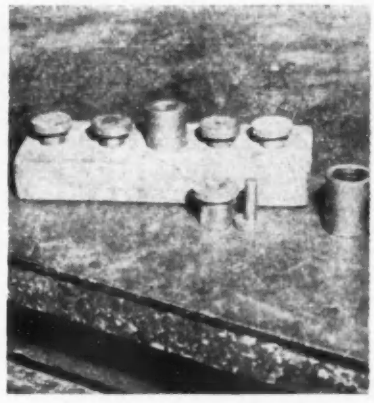
The two metal strips that support the box are made of angle iron tack welded to the drum part of the separator. Small diameter machine bolts support the insulating box.

The top of the box is concave shaped so that it fits closely to the drum. In extreme temperatures it is advisable to caulk the space between the box and the drum. Weep holes are drilled in the bottom of the box so any moisture can drain out.

## Forming Packing Rings

It is so much easier and faster to form packing rings before they are placed into position than it is to try to form the rings as the valve is being packed.

The picture shows the equipment that can be used to form these rings. Several different sizes are shown which are used for forming the packing in various size valves. The device consists of two parts. Both are made by machining so that the rings will fit as they



should in the valve. A piece of solid stock is machined out so that the inside dimensions of the hole are the same as the outside dimensions required for the packing rings. The other part is machined so that its outside dimensions match those of the inside of the rings.

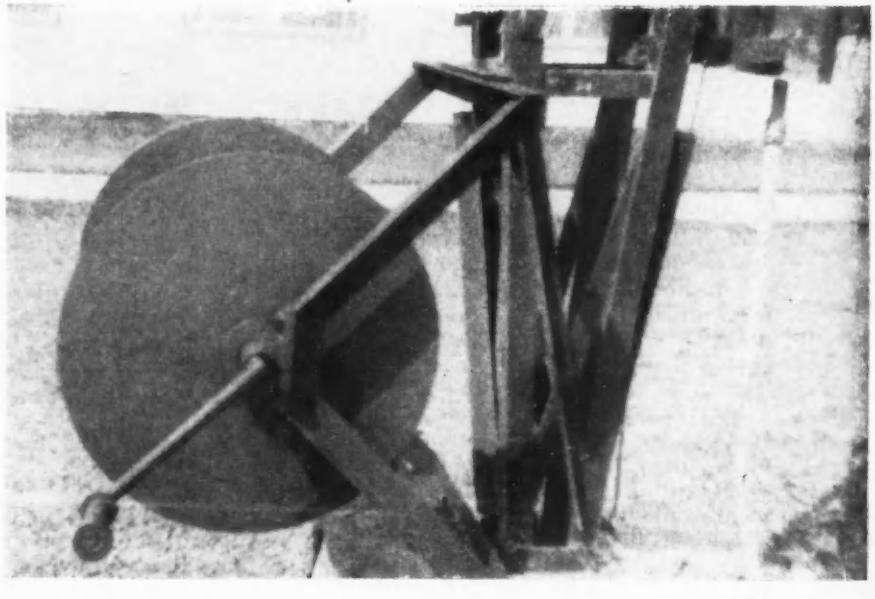
Rings are formed by wrapping the packing around the latter part and then driving the part and packing into the hole of the other part.

## Making a Hose Reel

A convenient hose reel that can be mounted at the base of a radio tower is an aid to plant maintenance. The hose can be quickly and easily wound around the reel.

To make the reel, weld two circular plates onto a length of eight-inch pipe. The plates should be sized in keeping with the amount of hose to be reeled upon the spool.

An axle through the center of the plates is shaped to form a crank. This axle runs through bearings made of small diameter pipe, clamped to the supporting framework. The framework is made of light angle iron bolted to the base of the tower.



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|---|---|---|---|---|
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| Electric Resistance and Fusion Weld—Plain End | 14" to 18" O.D. | Up to 40' | .250" to .500" | Napa, Calif.—Basalt-Kaiser |
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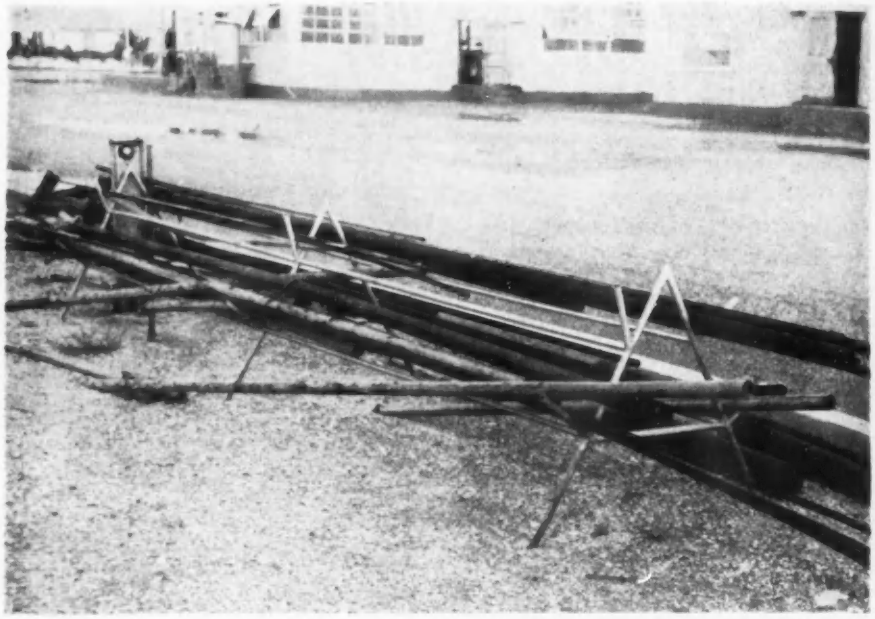
## Racking Small Pipe

Small diameter pipe around a station is a troublesome thing. It's too small to worry about, but too large to forget. Here is a pipe rack that can solve the problem. It can be fabricated by a welder in about two hours time. Simply construct the triangular bents out of light weight pipe, connect them with three longitudinal pieces of pipe, and you have a rack which will get you in good with the boss.

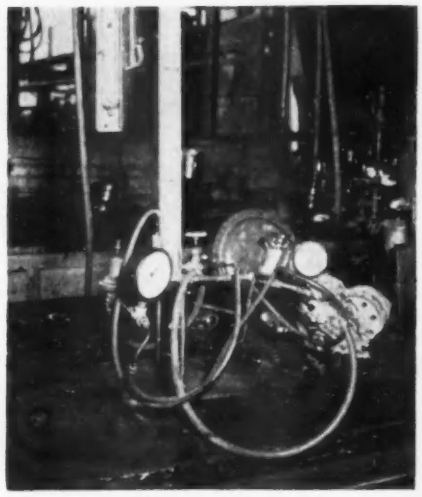
Pipe can be stored on the horizontal cross member as well as the lugs which are shown in the photo.



## Checking on Gauges

The test block shown is used to obtain a quick check on the accuracy of pressure gages. Both the fittings to which the gages are screwed and the manometers used for checking their accuracy are all mounted on a single stand for convenience.

Pressure to test the gages is supplied by the instrument air system. The block is manifolded so that the same pressure is applied to the gage and the manometers. One manometer uses water as the liquid and the other mercury.

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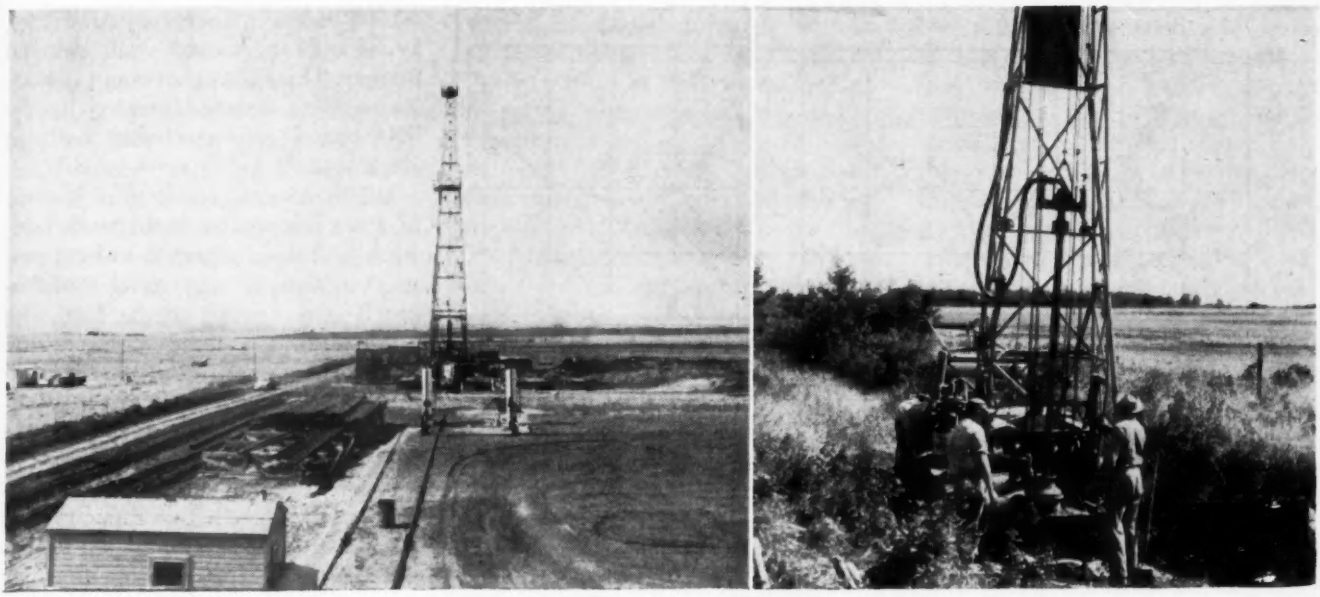

SCENES IN CANADA. Left is a drilling well in operation in West Drumheller field, about 60 miles northeast of Calgary. Right is a geophysical rig operating in farmland country between Edmonton and Redwater in central Alberta.

# 1953 a Fruitful Year for Canada

**Lack of market outlets holds check on any optimism, but crude potential climbs up and up as Saskatchewan drilling activity reaches peak.**

By **GILBERT M. WILSON,** WORLD OIL Staff

WESTERN CANADA, at year's end, finds itself facing the same old problem: lack of adequate market outlets.

With reserves and crude producing capacity climbing to an all-time high and with discovery rates racing along at a high level, Western Canada producers are forced, due to that lack, to hold production (August figures) to around 265,000 barrels a day. Prospects were that this figure would be reduced sharply because initial requirements of the Trans Mountain Oil Pipe Line were not as high as had been expected and because of a temporary curtailment of operations of Interprovincial Pipe Line while just-completed loop tie-ins were being made in the system.

Western Canada producibility has continued to rise. Estimates by industry authorities place the over-all figure at between 320,000 and 370,000 barrels per day. About 300,000 barrels of this figure is credited to Alberta alone. Total Canadian demand for petroleum during 1953 is estimated at around 500,000 barrels, and belief exists that within another five years, the country could become self-sufficient in petroleum if productivity and reserves continue to mount at the rate indicated during the past few years.

Western Canada crude reserves now are estimated at close to two billion barrels, with perhaps three-fourths of that credited to Alberta. Alberta reserves are dominated by a relatively few fields—Redwater field is estimated to contain between 600 and 800 million barrels, followed by Leduc-Woodbend and Bonnie Glen, each with about 250 million; and Golden Spike, Acheson and Wizard Lake, each having about 100 million barrels each.

A noticeable falling-off in drilling activity in Alberta was occurring during the latter part of 1953. This was a result, some authorities say, of a temporary drying-up of risk capital needed for new exploratory projects and the fact that routine development work in most of the large fields such as Leduc-Woodbend, Redwater, etc., now is nearing completion.

Though the discovery rate remains high and numerous smaller fields have been recorded in the province and though prospects are that many more also will be found, the fact remains that the industry has found no major fields, at least not presently apparent, for the past year or so—fields which, with diversified ownership usually require a large number of rigs to develop.

**Saskatchewan Active.** Concurrent with the recent slackening of Alberta drilling activity has been the unprecedented increase in Saskatchewan activity. Official figures show that Alberta footage for 1953, through August, had dropped about 3 percent —to 4.12 million feet from the 4.26 million feet drilled through the same period last year. At the same time, Saskatchewan, which by August 31, 1952, had drilled only slightly more than three quarters of a million feet, by the end of August this year had drilled 1.46 million feet, almost double the 1952 figure for the comparable period.

This shifting of interest and corresponding activity may be attributed to several factors, none of which is

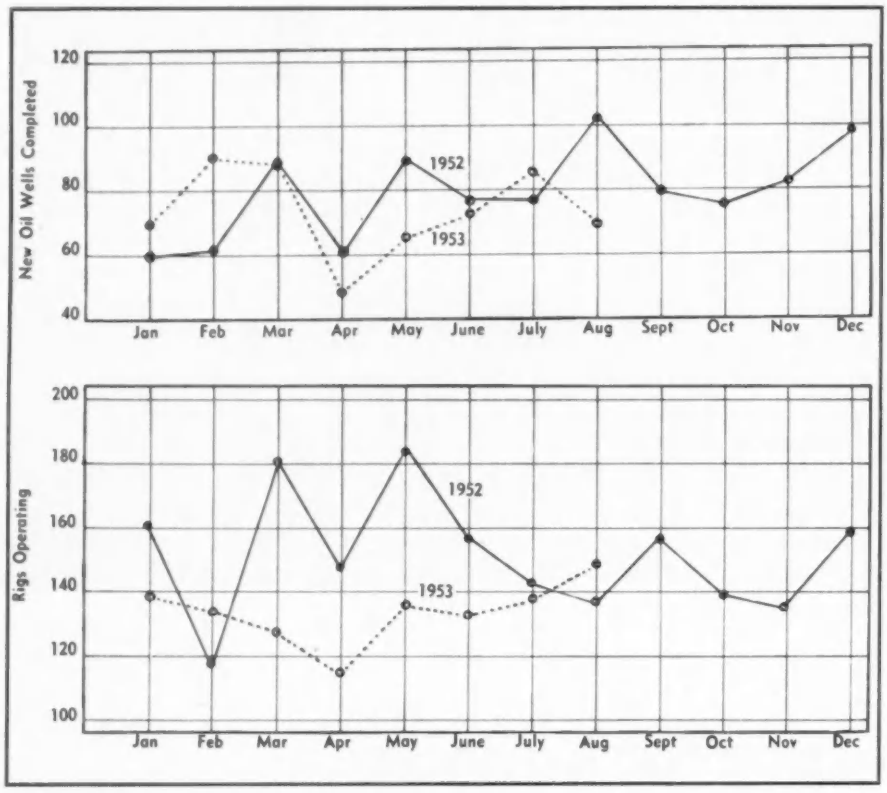


**Fig. 1**—Upper curves compare Alberta monthly new oil well completion rate for 1952, with rate through August, 1953. Lower curves show that in July and August a slight upturn was made in rigs operating.

clearly defined. Among the factors are:

- Relatively greater availability of likely areas in which to prospect.
- An indicated willingness on the part of some major companies holding large blocks in the province to farm out acreage to more rapidly evaluate their holdings.
- Moderate depths to prospective pay zones.

Behind the current fall-off in demand for crude—and Alberta producers are bearing the largest share of it—is a combination of events that could not have been foreseen earlier this year. Because of a raise in California crude prices in February of this year, it seemed likely that Canadian crude, which by late fall would be reaching Vancouver via the Trans Mountain line, easily would be competitive with similar gravity crude in California, even after paying the 10½ cents per barrel duty.

At about the same time, also, Trans Mountain Oil Pipe Line reduced its tariff from 60 to 45 cents per barrel, placing Canadian crude at an even greater competitive advantage.

**Price Increase.** Then, in June, a general crude price increase occurred in the areas east of the Rocky Mountains and shortly thereafter was followed by similar advances in Canada and elsewhere in the world. This wiped out part of the price advantage that Canadian crude might have had in California. Also, at about the same time, world tanker prices, probably influenced in part by a reduced demand for tankers as a result of the Korean truce, began to slide off, reaching a low somewhere in the region of USMC minus 50.

These events, occurring just before the Trans Mountain line went into operation, meant that it no longer was possible for Canadian crude to compete with California markets since, with cheaper tanker hauling, Persian Gulf and other foreign crude could be laid down at California points at lower cost than Canadian crude.

It now appears that any increased demand occasioned by completion of the Trans Mountain line will be limited initially, to only 15,000 to 20,000 barrels per day but which, with completion of refinery expansion programs in the Vancouver area, should increase to 30,000 to 35,000 barrels by year's end. By fall of 1954, General Petroleum Corporation's 35,000-barrel refinery at Ferndale, Washington, is expected to provide a further outlet and, a year after that, Shell's 50,000-barrel refinery at Anacortes, Washington, should swell demand further. This forecast does not include increases in demand created by the 5000-barrel refinery being built at Kamloops, B. C.

While Alberta crude thus is being at least temporarily held back from what had been expected to be a new market, signs are appearing that Saskatchewan, coming to the fore with an increasing volume of discoveries brought on by an upsurge of wildcat and development activity, may attempt to obtain a greater share of the Western Canada crude market.

Currently, it is estimated that Saskatchewan's productive capacity is in the order of 40,000 to 50,000 barrels per day, only 7500 barrels of which currently is finding markets. That condition cannot continue for long if exploration incentive is expected to be maintained in the province. Partial solution to this may be forthcoming in the proposed crude pipe line being considered for the Fosterton-Success-Cantuar area, one of the larger producing areas now suffering from lack of market outlets.

**Natural Gas.** Natural gas reserves in Western Canada, now standing at an estimated 10 to 14 trillion cubic feet, continue to mount at a rapid pace. With no major market outlets other than those within the western provinces, and with gas wells closed in or producing little revenue, small incentive remains to explore for new reserves. It is the opinion of some authorities in Western Canada that once a market has been established the prairie provinces will experience an upturn in activity and considerably more exploration work, now shelved, would be undertaken.

Geophysical exploration work, although down from last year, continues to hold at a high rate. Geophysical crews in the field this fall numbered about 150, down 33 from the near-record number in the field the same time last year. Crews this fall consisted of 141 seismographs, eight gravity meters and one airborne magnetometer. One hundred fifteen crews were at work in Alberta, 29 were in Saskatchewan, 4 in British Columbia and 2 in Manitoba.

It is estimated by the Canadian Petroleum Association that during the current year an average of about $1 million will be spent each day in Western Canada in the exploration

and production of petroleum and natural gas.

The gloomy aspect of the current problems is felt by many to be temporary. Increasing capacity of refineries on the West Coast, construction of new refineries in the U. S. Pacific Northwest, probable outlet for products in the Canadian Northwest and Alaska region as a result of the construction of the Haines to Fairbanks 20,000-barrel-per-day pipe line, and, probably of even greater importance, an increasing demand nationally for Canadian crude, ultimately will absorb much excess producing capacity.

Illustrative of this increasing demand is that whereas demand in Canada for petroleum in 1946 was only 224,000 barrels, 1953 demand, only seven years later, had mushroomed to 500,000 barrels per day. The increase this year over 1952 demand is estimated at 8.5 percent.

Highlights of 1953 operations, important discoveries and other pertinent happenings in the provinces during the year follow.

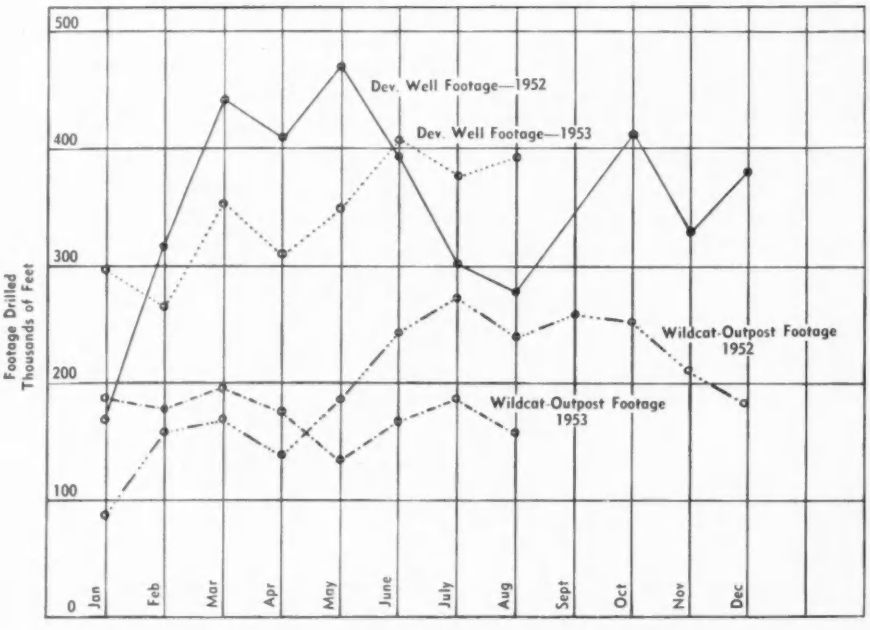


Fig. 2—Curves show that while Alberta wildcat and outpost drilling during 1953 was falling behind the like 1952 months, development drilling was rising.

## Completions Down in Alberta . . .

In Alberta, a total footage for the month of August, according to the Alberta Petroleum and Natural Gas Board, amounted to 548,620 feet, as compared with 560,741 feet for the previous month, and 515,935 feet for August, 1952. Cumulative figures show that as of the end of August, a total of 4,121,284 feet had been drilled, a slight reduction from the 4,264,336 feet drilled up the end of August, 1952.

Number of rigs active in the province during August however, showed an increase over the previous year. In August, 148 rigs were operating, an increase of 11 from the previous month, and an increase of 12 from August, 1952.

Total oil wells capable of producing at the end of August numbered 4224, an increase of 68 from the previous month, and a gain of 886 from the same period the previous year.

**Completion Rate Down.** The rate at which new wells in Alberta were being completed, however, was down from that of a year ago. During August, 69 new oil wells were officially completed. This was a drop of 16 from the 85 completed in July, and a sizable reduction from the 102 new oil wells completed during August of the previous year. Figure 1 shows this year's oil well completion rate as compared with that of 1952.

Cumulatively, the province saw 586 new oil producers completed up to the end of August, down 26 from the 612 wells that had been completed up to the same time last year.

New gas wells completed to the end of August, however, showed a sharp increase, with 34 having been completed as compared with only 9 during the same period last year.

A breakdown of 1953 footage figures for Alberta, through August, shows that in the second quarter of this year a change occurred which was continuing as the year drew to a close. In the first quarter, wildcat and outpost drilling, based on footage figures, had been at a rate generally above that for 1952. In May of this year, however, wildcat and outpost drilling dropped sharply below the corresponding month in 1952 and, through August, has consistently been below the 1952 drilling rate. (See Figure 2.)

**Risk Capital Scarce.** It would seem significant that this fall-off in exploratory drilling apparently reflects the current belief that risk capital has at least temporarily partially dried up; that smaller, less well-financed companies are consolidating and retrenching until new capital can be obtained for purely exploratory drilling projects.

Almost simultaneously with the decline in exploratory footage in Alberta, there occurred an upturn in development well footage, reaching a point in June of this year where it surpassed the drilling rate of the corresponding period in 1952, and held a substantial lead through August.

Total footage, including exploratory, outpost, deep tests and development, during most of this year, remained under the corresponding monthly figures for 1952. However, for the first time since January of this year, the August figures show that footage made during the month exceeded the like 1952 month by about 33,000 feet.

## Sturgeon Lake making news . . .

The Sturgeon Lake area of northwestern Alberta continued to make news during 1953.

Amerada Petroleum, following up its initial discovery in the fall of 1952 of high gravity oil in D-3 Devonian reef some four miles northeast of Sturgeon Lake, this spring brought in a second D-3 reef well, their Crown "R" F 3-19, at a location some 14½ miles southeast of its initial find. This second discovery tested initially for 1860 barrels daily of 38-gravity crude through 29/64th-inch choke from the

upper portion of an 80-foot pay interval topped at 8706 feet.

The company has been keeping three to four rigs working in the area and although some dry holes have been recorded, some additional important step-out exploratory tests have been completed. Among these oil completions are: **1.** Amerada's Crown "O" F 33-6 about 1½ miles northwest of their 1952 discovery, which was completed for 470 barrels daily of 37.9 gravity crude through 12/64th-inch choke from a 90-foot interval topped at 8858 feet.

**2.** The company's Crown "Y" F 2-11, slightly more than four miles southeast of their Crown "R" F 3-19, and which at last reports was testing more than 80 feet of reef pay zone, top of which occurred 103 feet higher than the "R" F 3-19 well. In one of the flow tests, this most recent success flowed 37 gravity oil at rates in excess of 1700 barrels daily through restricted choke.

Development of high gravity oil in thick D-3 Devonian reef sections in this part of the Peace River area, some 175 to 200 miles northwest of Edmonton, is very significant, and opens up vast new areas for possible reef production.

## Extension indicated SW of Edmonton . .

ANOTHER AREA receiving considerable attention in 1953 and which was highlighted by several significant stepout discoveries was the Westerose-Homeglen-Rimbey-region, southwest of Edmonton.

New finds in this area, a southwestward extension of the prolific Wizard Lake-Bonnie Glen-Pigeon Lake (the latter now known as Westerose) trend, noted for exceptionally thick wet gas and high gravity oil sections in the D-3 Devonian coral reef has suggested a possibility that this important reef trend may continue on to the southwest for perhaps 20 to 30 miles.

In May, Calmont Oils Limited completed its Calmont Rimbey, situated some 24 miles southwest of the Pigeon Lake sector, for 75 barrels daily of 41.7 gravity crude from a 35-foot pay zone in the D-3 reef with gas-oil interface topped at 7995 feet. In addition, a 102-foot wet gas column section in the upper portion of the D-3 tested for an estimated potential of about 5 Mmcf. per day.

About seven miles southwest of the southeasterly tip of Pigeon Lake, California Standard, in June, completed a wet gas discovery from 117 feet of D-3 Devonian coral reef section topped at 7548 feet. This discovery, known as South Westerose, showed for an initial potential of more than 6 Mmcf. daily.

In July, about midway between the Rimbey and South Westerose discoveries, another D-3 reef discovery was made. California Standard, in its Homeglen exploratory well, completed it as a combination oil-wet gas producer from Devonian reef topped at 7555 feet.

Full significance and evaluation of these widely spaced stepout discoveries along the Bonnie Glen-Westerose Devonian coral reef trend must await further development of these finds. Suffice to say, however, that a keen interest exists in the area and activity along the trend will remain brisk for some time.

## Viking Sand still expanding . . .

CONTINUED EXPANSION and infill-development continued during 1953 in the Viking Sand trend southeast of Edmonton. Although drilling had slackened to where, by fall, only six to 10 rigs were operating in the area, this multi-field sand trend, consisting of Joseph Lake at the north end, Armena-Camrose, South Camrose and, a 1953 find, Battle field three miles south of South Camrose, has expanded remarkably during the past year.

Total monthly production from the above principal areas, during August, amounted to 380,376 barrels, an average of about 12,300 barrels daily, a sharp increase over the 220,138 barrels, or 7100 barrels daily, produced during the like month of 1952.

Total producible wells in the same fields, during August of this year totaled 372, almost double the 188 wells capable of producing during August, 1952. This trend represents the largest light gravity oil, sand reserve in Alberta. Recoverable reserves in the Joseph Lake and Armena-Camrose fields, alone, amount to an estimated 105 million barrels. Relatively shallow depths, averaging about 3200 feet, high gravity oil ranging from 37 to 39 gravity, and easy drilling, combine to make this trend an attractive area for many smaller independent companies.

Development of the currently active Devonian D-2 West Drumheller field (a 1952 discovery) some 60 miles northeast of Calgary and about seven miles west of Drumheller, received further impetus this September when production was discovered in the D-3 reef formation.

Following closely on the heels of this D-3 zone find was another discovery in the same field of 31-gravity oil in the Green Shale member of the Devonian, a section that, until now, had not shown for commercial recovery in the province. This new discovery, as yet not fully tested, makes this a three-zone field, and undoubtedly will cause this area to remain in the very active category for some months to come.

Among some of the other important oil discoveries recorded in Alberta so far this year were:

**1.** A dual zone D-2, D-3 oil find at Fairydell, 25 miles north of Edmonton and which also found an estimated 6 Mmcf. of gas in the Viking.

**2.** Two D-1 discoveries—one at Bawlf, about 12 miles east of the Armena-Camrose area, where 30-gravity crude flowing initially at a 480-barrel daily rate, was obtained from D-1 Devonian limestone topped at 3465 feet, and the other at Eyremore, some 45 miles north of Taber, where 41.6-gravity crude was obtained from D-1 limestone topped at 4778 feet.

**3.** In the Samson Lake sector, 15 miles south of Wetaskiwin 28.4-gravity crude was found in the Basal Quartz section of Lower Cretaceous topped at 4790 feet. Several miles south, 34-gravity crude, producing initially on potential test at a 1500 barrels per day rate, was found in the D-3 Devonian coral reef topped at 5352 feet.

**4.** Near Ewing Lake, 12 miles southwest of Stettler, D-2 and D-3 production was discovered at two wildcat locations. In the first discovery, 29-gravity oil from the D-3 Devonian reef, topped at 5509 feet,

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flowed through restricted choke at a rate of 80 barrels daily and, in a subsequently drilled well about two miles northeast of the first, D-2 production, but with some water, also was found. Canadian Gulf, which made both discoveries, still is developing the new finds.

**5.** Production of 40 gravity crude at rates up to 500 barrels daily was obtained at Springburn, 35 miles southeast of Peace River town, from a 15-foot section of pay in the Beaverhill Lake section of the Devonian limestone topped at 6763 feet.

**6.** At Glen Park, a mile south of the southwest tip of the Leduc Field, production from the Glauconitic sand (L.Cret.) was discovered. A 31-foot column of water-free pay section was topped at 4610 feet.

**7.** During June, an important wet gas discovery was made by California Standard in the Sylvan Lake area west of Red Deer. Gas at an estimated 4 Mmcf. per day rate, was discovered in the Mississippian lime topped at 7012 feet.

## Saskatchewan drilling at peak . . .

THE MONTH OF AUGUST saw Saskatchewan attaining an all-time high in drilling activity. Holding at between a 130,000 and 150,000-feet-per-month drilling rate, activity in the province suddenly leaped ahead, reaching in only three months, a new high of 283,782 feet per month in August (See Figure 3). Footage drilled during August brings cumulative footage for the year to 1,464,741 feet, an all-time high for the province and almost twice the footage, 794,456 feet, made in the same eight-month period last year. It will be noted that all figures issued for Saskatchewan footage are those for completed holes.

Data compiled by the Canadian Petroleum Association reveals that during the first six months of the year, Saskatchewan showed a 59 percent increase in production; 55 percent increase in all wells drilled and 72 percent increase in footage drilled, as compared with the like period of 1952.

During the first eight and one-half months of 1953, the province had recorded an indicated 16 new oil discoveries and three new gas discoveries.

Every indication points toward the province becoming even more attractive for exploration. As had become apparent nearly a year ago, the large holdings held by major companies could not be adequately explored and as a consequence, farmouts were being made to smaller operators. This, combined with the fact that drilling depths are moderate, more medium and high-gravity fields are being found and operators could be more selective in the acreage taken up. Also important is the fact that pipe line outlets both oil and gas, are being planned to provide much-needed outlets for crude now being held back due to lack of market.

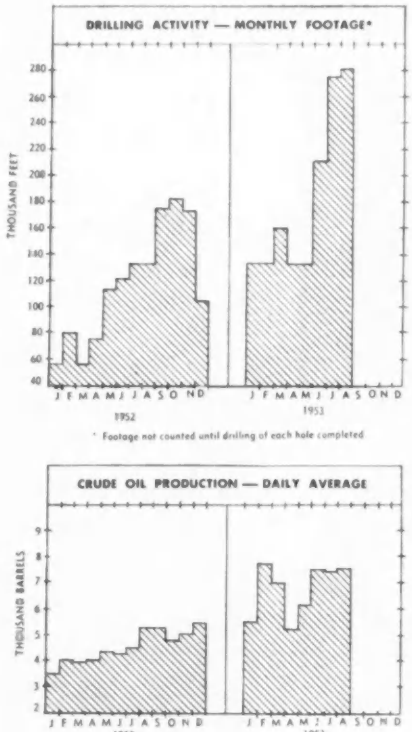


**Fig. 3**—Chart shows drilling activity from January, 1952, through August, 1953.

*—Chart from Monthly Oil and Gas Report of Saskatchewan Department of Mineral Resources, Regina, August, 1953.*

During August, 1953, 395 producing well were operating, a drop of 19 as compared with those operating the previous month. The heavy-oil producing Lloydminster field, with 158 wells producing, in August, accounted for 40 percent of the total number of operating wells. Coleville field, with 88, and Lone Rock, with 87 wells, followed in second and third position. During the year, 276 new oil wells were completed.

Production of crude in Saskatchewan by the end of August, 1953, had totaled 1,662,722 barrels, compared with 1,058,568 barrels during the same period last year, according to the Saskatchewan Department of Mineral Resources.

Crude production during August totaled 230, 150 barrels, or 7.440 barrels per day, from 395 producing wells in the province. This compares with a production rate, in the same month of 1952, of 165,930 barrels, or 5350 barrels daily.

Keen interest was being shown in the Williston-Bobjo team discovery of 27-gravity crude, swabbed initially from Madison horizon of the Mississippian at rates up to 20 barrels hourly, in the Forget area, scene of a discovery early this year by Tide Water. The Tide Water find created considerable excitement when from the Madison, topped at 3886 feet, it produced on initial potential tests in excess of 3000 barrels daily of 29-gravity crude. Development work continues in this area, siuated some 50 miles southwest of the Wapella field in southeastern Saskatchewan.

## Manitoba output sets a record . . .

MANITOBA PRODUCTION during August reached a high of 56,490 barrels, about 92 percent, or 51,760 barrels, of which was produced by some 56 wells in the Daly field, largest field so far developed in the province.

Output from the Daly field has been increasing due to the Interprovincial Pipe Line having been made available as a crude outlet. Deliveries to the lime have been made by tank truck to the station at Cromer. Main flow of the Interprovincial line is stopped periodically to allow 5000-barrel shipments of the Daly crude. Tank truck hauling is to be discontinued from the field soon, however, as construction work has commenced on a 12-mile pipe line gathering system which will deliver crude directly to the Cromer station. It is expected that the line will be completed some time this fall.

Crude produced in the province during the first eight months of the year, new producers added during

each month, and total footage drilled follow:

| Month—1953 | Barrels Produced | New Producers Added During Month | Footage |
|---|---|---|---|
| January | 43,091 | 2 | 3,813 |
| February | 39,843 | 3 | 6,095 |
| March | 35,328 | 0 | 10,407 |
| April | 29,430 | 0 | 14,329 |
| May | 28,630 | 0 | 24,145 |
| June | 27,387 | 7 | 30,755 |
| July | 33,990 | 6 | 25,053 |
| August | 56,490 | 11 | (Not avail.) |

New discoveries in Manitoba this year include:

**1.** A Mississippian lime, 50 barrels-per-day, 34-gravity crude completion in the Whitewater sector by California Standard. Mississippian pay in this outpost, some 45 miles southwest of Brandon, was topped at 2515 feet.

**2.** About a mile west of Virden in the Roselea area, McIvor Drilling Company completed a discovery in August in the Mississippian lime capable of producing about 140 barrels per day of 34.5-gravity crude. Top of pay was logged at 1976 feet.

**3.** Late this year, still another discovery in this same area was made by British American Union Oil Company which, at last reports, was flowing initially on test at rates as high as 40 to 50 barrels hourly of 34.5-gravity crude, producing from perforated interval 2060-2088 feet. This strike, the first in the province to flow initially at such high rates, doubtless will focus a great deal more attention on this part of Manitoba over the coming months.

## British Columbia pace steady . . .

BRITISH COLUMBIA activity continued to maintain a steady pace during the year, efforts being confined principally to exploratory projects designed to expand and evaluate the huge Fort St. John gas field and surrounding areas.

Pending a decision by the U. S. Federal Power Commission on whether Westcoast Transmission Company will be allowed to export gas from Vancouver into the U. S. Pacific Northwest states, Pacific Petroleums Limited, principal operator in the area, has not felt it necessary to do much infill drilling of the presently outlined productive areas.

During the first nine months of 1953, a total of 27 wells were spudded in British Columbia. During the same period, 15 wells were completed as potential gas producers, then closed in pending availability of market. Twelve more were abandoned. Rigs operating in the province have ranged from as few as 10 to as high as 15 in one month. Peak activity this year occurred in June and July when 15 rigs were at work.

Footage drilled has averaged, during the first nine months, about 17,850 feet per month, with the peak mark, 22,056 feet, occurring in September. Acreage under lease or permit in September, with 492 permits recorded, amounted to a total of 33,835,783 acres.

During the year, several new discoveries of gas were made in the province:

**1.** A wet gas Triassic find was made in the Nig Creek area, 20 miles northeast of mile post 120 on the Alaska Highway.

**2.** Another Triassic discovery was made in the Blueberry Mountain area south and west of the Nig Creek area.

**3.** Discoveries in the Buick Creek area, 40 miles northwest of Fort St. John, and another in the Pingel Creek region nine miles southwest of Fort St. John, found gas in the Cadomin sand of Lower Cretaceous.

Gas reserves in the Peace River area, which includes areas on both sides of the Alberta-British Columbia border, are estimated to be in the order of 3.75 trillion cubic feet, about three-quarters of which lies in British Columbia, and by far the greater part of the latter being in the 25-mile long by 6-mile wide Fort St. John gas field. This latter field, whose limits still have not yet been fully defined, has been developed so far with only about two dozen wells; development drilling within these widely-spaced exploratory holes not being anticipated until after authorization for construction of the pipe line has been received.

Northwest Territories, through September of this year, had tallied seven completions, all dry holes. At last reports, one drilling rig was in operation on a wildcat in the area.

## Trans Mountain line completed . .

HIGHLIGHT OF PIPE LINE activity in Western Canada during the year was the completion in mid-October of the 718-mile, 24-inch, $93 million Trans Mountain Oil Pipe Line between Edmonton and Vancouver. The line, designed for an initial capacity of 120,000 barrels daily, is expected to be increased to 150,000 barrels daily capacity by year's end, with completion of a fourth pumping station. Ultimate capacity of the line, by construction of a total of 14 pumping stations, will be 300,000 barrels daily.

At present, however, the line by year-end will be handling only about 30,000 barrels per day, the approximate limit of capacity of refineries operating in the Vancouver area.

With early completion of expansion programs now under way at Vancouver refineries, the completion in the fall of 1954 of General Petroleum Corporation's 35,000-barrel refinery at Ferndale, Washington, and, the following year, Shell's 50,000-barrel refinery at Anacortes, Washington, it is expected that Trans Mountain throughput will be stepped up to planned levels. Additional demand will come, also, from a 5000-barrel refinery now under construction at Kamloops, B. C., on the route of the Trans Mountain line.

The extension line which will carry Trans Mountain crude to General Petroleum Corporation's Ferndale refinery calls for a 24-inch pipe line for a distance of four miles within Canada and an additional 14 miles within the State of Washington. A 12-mile lateral of 16-inch pipe then will be built to a point near Laurel, Washington, directly to the Puget Sound site of the refinery. The pipe line spur is expected to be finished by the time the refinery is completed.

Another major 1953 pipe line project, not located in Western Canada but having an important impact on operations there, is the 625-mile, 30-inch pipe extension of the Lakehead Pipe Line, designed to connect the former lakehead terminus at Superior, Wisconsin, with the Sarnia, On-

tario, refining center. The Lakehead Pipe Line, a subsidiary of Interprovincial Pipe Line Company, is that portion of the system which dips down through U. S. territory connecting with Interprovincial at Neche, North Dakota, and, until now, terminating at Superior.

Completion of the extension will mean year-round transportation of crude from Western Canada fields directly to Sarnia, eliminating the heretofore necessary winter close-down of operations when freezing of the Great Lakes prevented tankers from relaying crude from Superior to Sarnia. When completed, the Interprovincial and Lakehead system will be the longest crude pipe line in the world. Additional capacity in the system is being gained also, by construction of 137 miles of 24-inch looping between Regina, Saskatchewan, and Gretna, Manitoba.

Interprovincial Pipe Line, with expansion work completed, will be capable of moving 170,000 barrels of crude per day. Lakehead Pipe Line, it is reported, will be able to handle 80,000 barrels per day initially.

In Alberta, Imperial Pipe Line Company this year looped its Devon-Edmonton crude line by 4½ miles from Devon to Nisku and 14 miles from Nisku to Edmonton. Another important system was expanded when Texaco Exploration Company laid 32 miles of 16-inch crude pipe line between Calmar and Edmonton. This looping project was designed to increase capacity of the system in order to keep abreast of rapidly expanding production from Wizard Lake-Bonnie Glen reef trend fields extending southwestward from Edmonton.

There appeared to some encouragement, late this year, that an important crude pipe line outlet might be shaping up for the several medium-gravity crude fields in the Fosterton-Success-Cantuar area of southwest Saskatchewan. Lack of market outlet has kept production in this area to less than 1000 barrels daily (for first eight months of year), although potential production capacity is estimated to be in the neighborhood of 15,000 to 25,000 barrels per day.

Under consideration by Socony-Vacuum, principal operator in the area, are five alternate methods of securing an outlet:

**1.** Building a $100 million pipe line from Fosterton area to Minneapolis region, passing through the Williston Basin enroute to serve fields there.

**2.** Constructing a 150-mile line eastward to Regina and there tie in with Interprovincial line.

**3.** Building a 270-mile line northwestward to Edmonton, to tie in with Trans Mountain line.

**4.** Building a 200-mile line northwestward to Stettler field in Alberta to tie in with Canadian Gulf's line delivering crude to Edmonton.

**5.** Construction of a refinery at Regina which would extract asphalt and heavier ends of the Fosterton area crude and shipping the remainder on through the Interprovincial line.

## Natural gas export discussed . . .

EXPORT OF NATURAL GAS from Western Canada, together with the pipe lines that would be needed, either to Eastern Canada or the U. S. or both still was a topic of much discussion during the year. By fall, however, little had been settled and the whole question still was up in the air.

Mid-Continent Pipe Lines Limited, one of the contenders for rights to move Alberta gas eastward, via Minnesota and Michigan points, in September announced it was withdrawing its application. This left Trans Canada Pipe Lines and Western Pipe Lines still in the race. The former would follow an all-Canada route, while the latter would take gas east to Winnipeg, then south to St. Paul to satisfy a market demand there, then, later, build an extension to eastern Canada.

Westcoast Transmission Company, although holding a 22-year Federal export permit, granted last April, to export Peace River gas out of the country, still is awaiting some word from the U. S. Federal Power Commission, which has final say in whether such gas will be allowed to move across the border to serve cities in the U. S. Pacific Northwest. This project, a 723-mile, 24-inch pipe line, would deliver Peace River gas to Vancouver, then on down into Washington and Oregon. Total mileage under the Westcoast combined projects, including all sales laterals, if approved, would amount to approximately 1940 miles.

Complicating the picture further was the recent action by the U. S. Federal Power Commission in granting authorization to export to the Toronto area 22 billion cubic feet of gas annually. This proposed project, which would involve the laying of only 87 miles of new pipe line between the border and Toronto, up to this time has not received formal permission from the Canadian Board of Transport Commissioners.

Believed to be another possible market for Western Canada oil products is the recently-announced 615-mile Haines, B. C., to Fairbanks, Alaska, products pipe line to serve military installations, both Canadian and U. S., in the far north. This project, which, in effect will be a torpedo-proof route to interior Alaska, will be an eight-inch line designed to carry avaition gasoline, jet and diesel fuel. Contracts have been let and completion of the project is scheduled some time in 1955.

**ACKNOWLEDGMENT**

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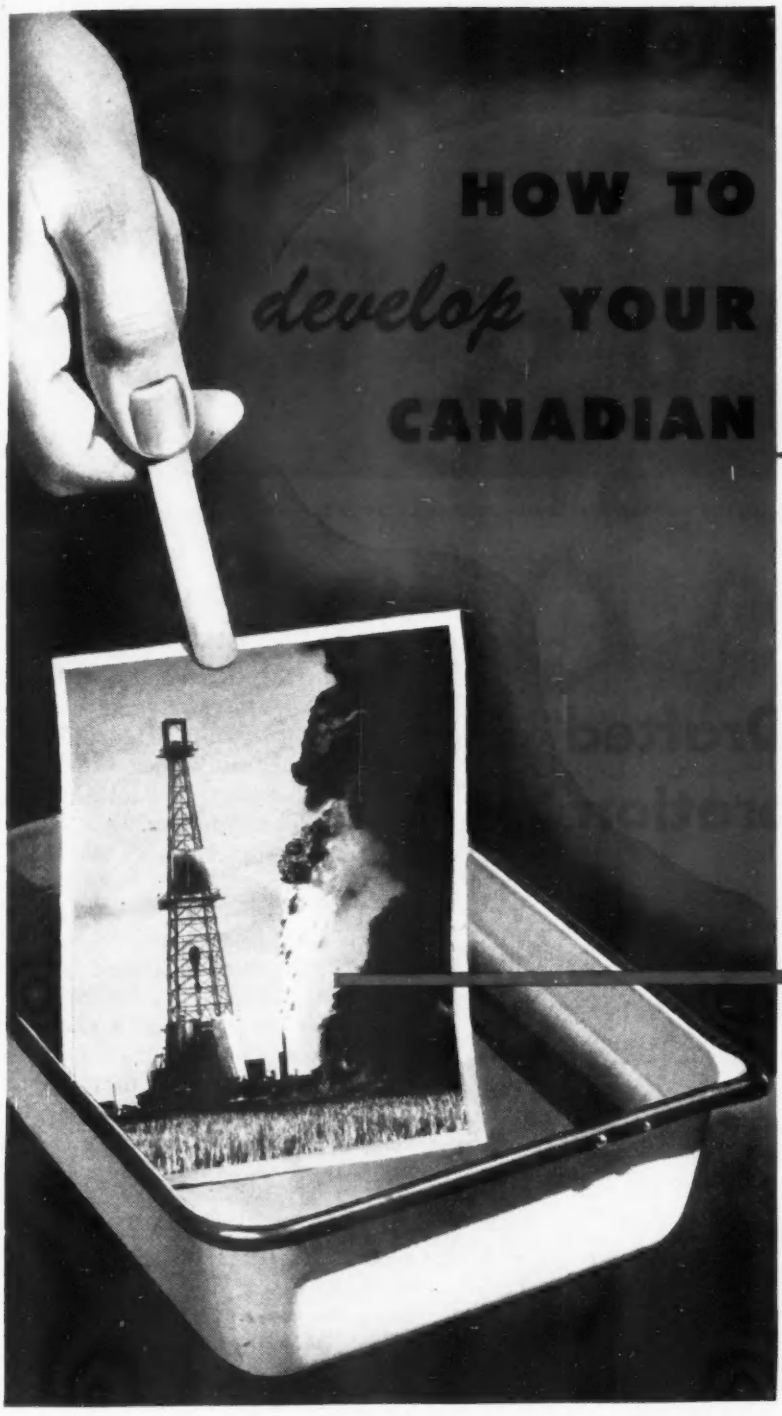
**In this issue of WORLD OIL . . . your two-color map of Western Canada showing gas and oil fields, pipe lines and the principal cities.**



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STORAGE TANKS at Norman Wells. Bear and Goose islands and the Mackenzie mountains are in the distance, across the Mackenzie River.

# New Grid System Drafted To Speed Up Exploration

## 'Staking on the map' eliminates the possibility of disputes and simplifies acquisition of land.

**By DR. ARTHUR B. IRWIN,** Petroleum Conservation Engineer, Northwest Territories and Yukon Territory, Edmonton, Alberta

CANADA's Department of Resources and Development has recently effected a new set of regulations governing oil and gas rights in the Northwest Territories and Yukon Territory —drafted to promote development of prospective petroleum resources.

Staking requirement for acquiring 64,000-acre permits to explore has been discarded in favor of "staking on the map" such permits in conformity with a grid pattern at 10 minute intervals of latitude and 15 minute intervals of longitude. Thus eliminated is any possibility of disputes and acquired is a simplification for both industry and administration of the routine of acquiring land. Exploration, drilling and production regulations have been altered to conform more closely with those in Alberta and Saskatchewan and with modern conservation practice.

These regulations are the result of discussions between the administration and the Canadian Petroleum Association, which represents industry.

**Location.** The Northwest and Yukon Territories, except for a few islands in Hudson and James bays, lie north of 60° north latitude. Together, they have an area of 1,460,000 square miles, comprising more than two-fifths of Canada. That portion of these territories underlain by post-Precambrian sedimentary rocks remote from igneous areas is indicated by Map 1.

It extends from the Great Plains region of the U. S. and Canada northwestward along the Mackenzie River basin to the Arctic Ocean. There, it splits into two belts, one of which extends westward along the Arctic coast into Alaska and the other northeastward in an arc covering the northwesterly portion of the Arctic Island archipelago.

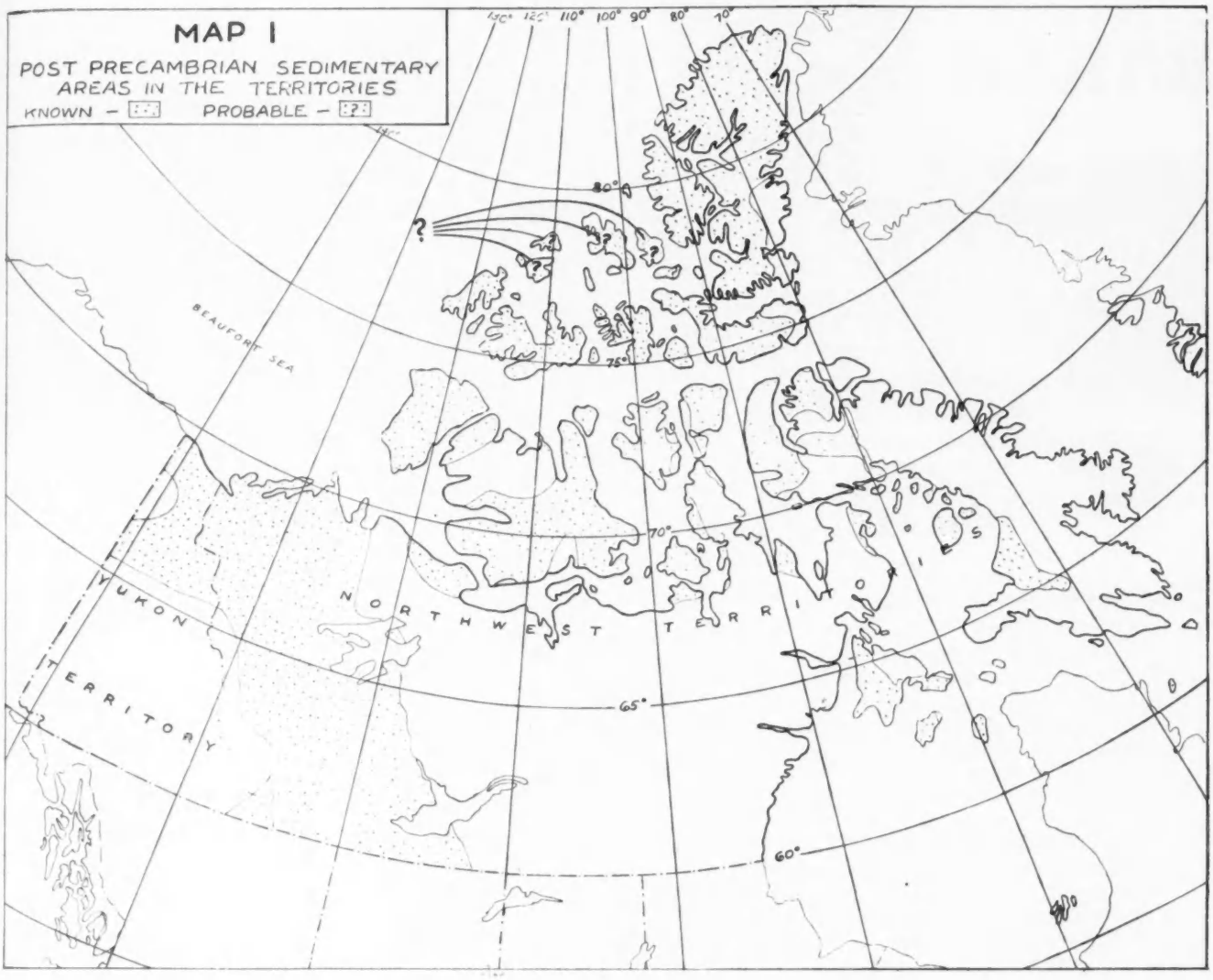
Paleozoic sedimentary rocks cover large parts of the islands south and east of this arc. Many of the sedimentary formations included in the indicated area are either too thin or too highly folded or faulted to be favorable for oil prospecting.

Oil and gas seepages along the Mackenzie River have been known since 1789. Discovery of commercial oil was made by Imperial Oil Limited in 1920 45 miles northwest of Fort Norman (latitude 65° 16′ north), but production for the local market did not commence until 1932.

As a war emergency measure, the U. S. government completed the development of the Norman Wells field under the Canol Project from 1942 to 1945. The refinery there has a current daily capacity of 1500 barrels and supplies local markets at Yellowknife, Port Radium and the settlements along the Mackenzie River and Arctic coast. During and since the Canol Project, 19 dry wildcat wells were drilled in the lower Mackenzie River region. Consequently, little interest was shown in the Mackenzie River basin for several years.

The exploration boom sparked by the Leduc discovery in central Alberta in 1947 spread northward until it literally burst the confines of the provinces. Since the middle of 1951 more than 30 million acres of land have been taken up in the Northwest and Yukon Territories under permit to explore for oil and gas (see map 2).

During 1952, 12 exploratory wells were drilled for a total of 16,854 feet, and geological and geophysical parties were engaged in mapping in the




upper Mackenzie River basin (between 60° and 64° north latitude). This exploration activity is continuing. There has been some encouragement in the discovery of non-commercial "shows" of oil in this region.

**Transportation.** Mackenzie River is the principal medium of transportation for heavy equipment in that part of the Northwest Territories now subject to oil exploration. Mackenzie Highway connects this water system and the highway systems of Alberta and British Columbia. From northern terminus at Hay River on the south shore of Great Slave Lake, equipment may be barged 900 miles down the Mackenzie River to its mouth in the Beaufort Sea with no serious navigational hazards.

An alternative water route is from railhead at Waterways, Alberta, down the Athabaska and Slave rivers and across Great Slave Lake to the head of the Mackenzie River.

This route includes a 16-mile truck portage at Fort Smith. Water transportation is possible for only about four months during the summer. Some winter freighting is done over tractor roads in the Mackenzie River basin. A commercial aircraft company maintains a passenger and freight schedule from Edmonton to all Mackenzie River points.

**Regulations.** Oil exploration in northern Canada is controlled by the government through the Territorial Oil and Gas Regulations administered by the Department of Resources and Development. The regulations fall roughly into two categories: land and conservation.

Oil and gas rights on territorial lands are administered through the Lands Division, Department of Resources and Development, Ottawa, Ontario.

To explore for oil or gas, a person or corporation must hold an exploratory license obtainable for a nominal fee. The license gives the right to explore by geological, geophysical and subsurface methods to a depth not exceeding 200 feet on all territorial lands. It is not necessary for the licensee to secure permission to pursue such exploratory work on lands already held under permit or lease by others.

Oil and gas exploration permits are granted for specific areas for a three-year period with an option to renew for three more years, without a 200-foot depth limit on subsurface work. A permit also gives the right to select up to 35 percent of the permit area for a renewable 21-year lease. Application for a permit must be submitted in person to the Lands Division in Ottawa, together with a $250 fee and a deposit of five cents per acre to guarantee this amount of money will be spent during the first 18 months of the permit.

Permit areas granted are based on

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**BAKER MODEL "H"**
**25 Range HINGE-LOK**
**Casing Centralizer**

***PRODUCT NO. 9113***

Recommended where NORMAL CLEARANCE is present, and no serious problem of over-size hole is anticipated. The "H-25" Centralizer is recommended where conditions are such that starting force would be a problem with the "H-50" Super-Range Centralizer, in which case the H-25 might be used on the first few joints and the H-50 run above it. Although the H-50 requires a larger spacing interval for easy starting than the H-20 or the H-25, fewer "H-50" Centralizers—with their superior reach—ensure even greater effective centering force.

### "Reach" (Bowed Height) is vital factor

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Increased reach means adequate, all-around cementing space even though the hole size varies considerably from the drill bit size. Without this increased reach, it is quite probable that casing may contact the wall of the hole between centralizers resulting in a poor cement job at that point.

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Baker HINGE-LOK Casing Centralizers can be *installed in a matter of seconds* while running-in, as *no welding is required*. Just close the HINGE-LOK Centralizer *around a coupling* and then insert drive nails which *thread themselves* into the hinge knuckles, and *will not come out*. When exact spacing is desired, easily installed Stop Rings can be plug-welded at required positions.

### Maximum effective centering force

Baker HINGE-LOK Casing Centralizers provide the most uniform annular cementing space around the casing. And this cementing space is present regardless of repeated flattening of the springs in a deep well, or of off-vertical condition of the hole.

The engineered bow shape of the springs, with an ideal relationship between the length and the bowed height of the springs, provides *greater landed centering force* than can be obtained from any other available hinge-type centralizer covering the same range of hole sizes.

### All springs work together

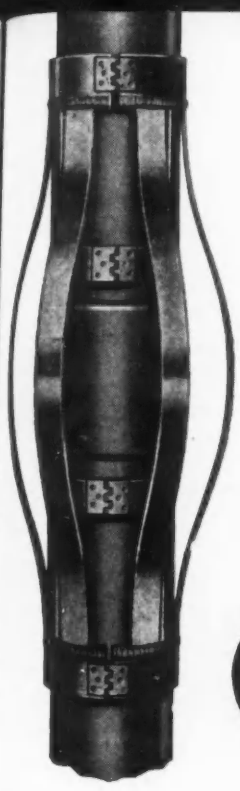
All of the powerful springs of Baker HINGE-LOK Casing Centralizers work together to offer a combined positive resistance against any tendency of the casing to contact the wall of the open hole. As the springs are forced toward the casing by contact with the wall of the hole, their effective length is decreased, thereby stiffening them and increasing their resistance to further deflection.

### Unlimited rotation of casing

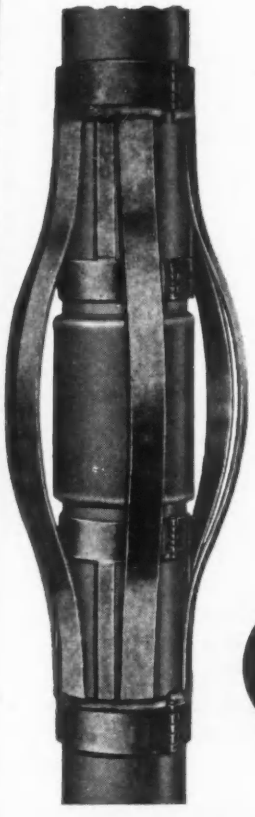
Whether Baker HINGE-LOK Casing Centralizers are installed around couplings or over a standard Stop Ring, the casing can be freely rotated without rotation of the centralizers.

### Easy starting without snubbing

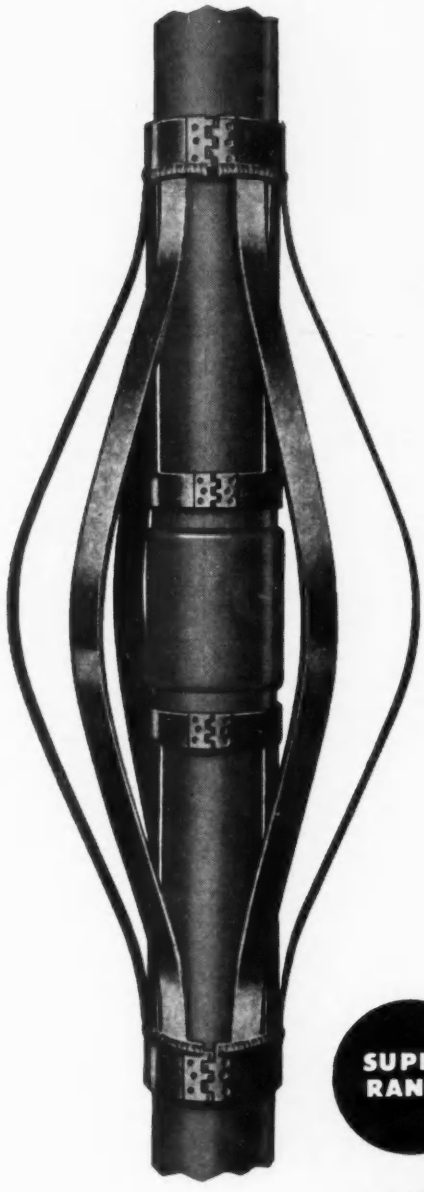
The superior spring design of Baker HINGE-LOK Casing Centralizers assures easy starting without sacrificing the powerful centering force delivered after full down-hole travel of the casing. By following the easily read "Starting Force Spacing Guide," all need for applying external starting force is eliminated even in relatively close-tolerance programs.



20 RANGE



25 RANGE



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**BAKER MODEL "H-50"**
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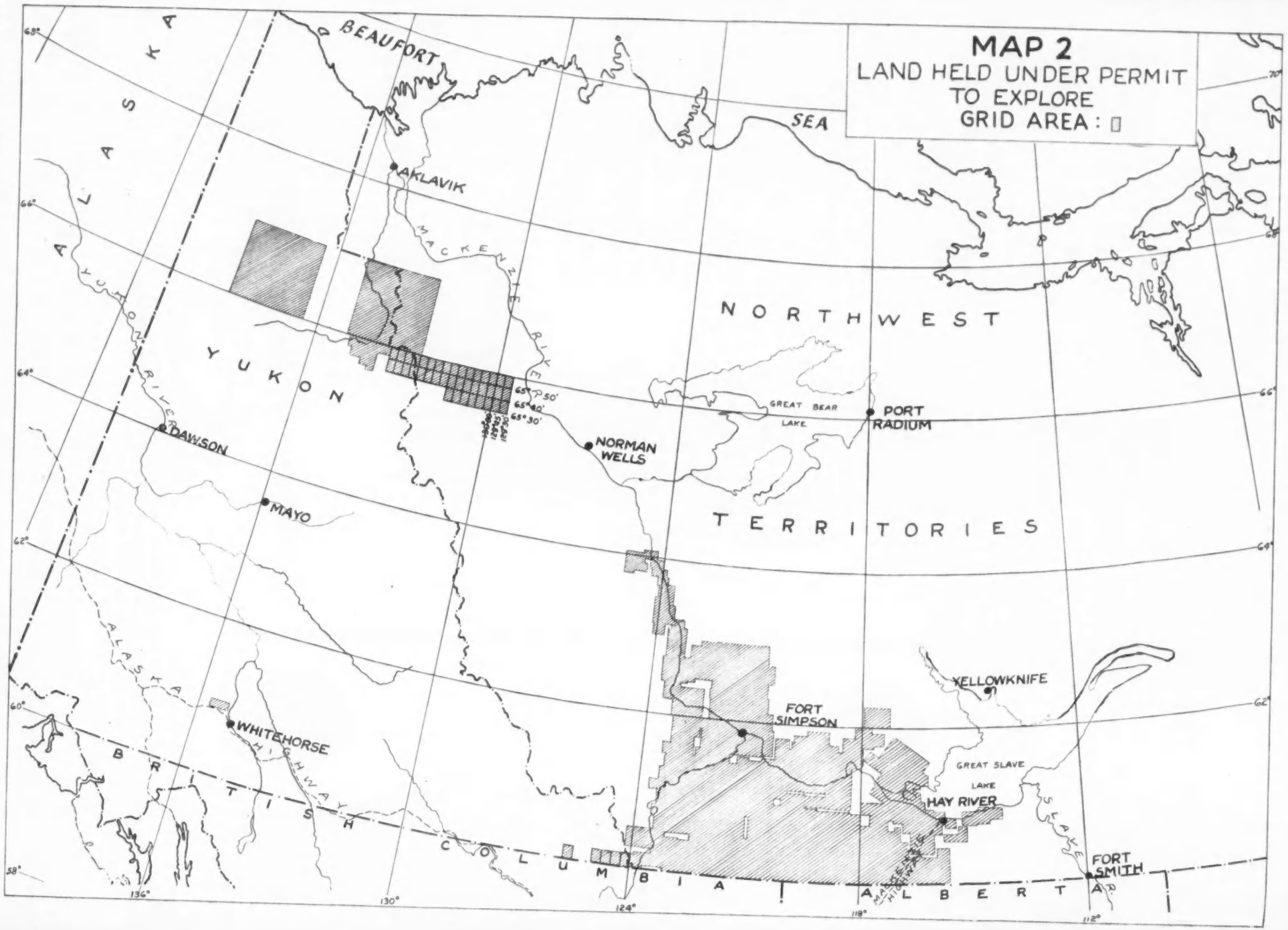
MAP 2
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ALASKA
AKLAVIK
MACKENZIE RIVER
YUKON
NORTHWEST
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YUKON RIVER
DAWSON
MAYO
NORMAN WELLS
GREAT BEAR LAKE
PORT RADIUM
ALASKA HIGHWAY
WHITEHORSE
BRITISH COLUMBIA
FORT SIMPSON
YELLOWKNIFE
GREAT SLAVE LAKE
HAY RIVER
SLAVE R.
FORT SMITH
ALBERTA
MACKENZIE HIGHWAY
70°
68°
66°
64°
62°
60°
58°
136°
130°
124°
118°
112°

a map gridded by each 10 minute parallel of latitude and each 15 minute meridian of longitude. Resulting rectilinear areas or "grid areas" each approximate 64,000 acres at the 60th parallel but due to convergence of meridians, each contains about 52,000 acres in area at the 66th parallel. Half grid areas may also be granted.

At the beginning of the second 18-month period, 25 cents an acre is deposited and similarly at the beginning of the fourth, fifth and sixth years, 30, 40, and 50 cents per acre, respectively, is deposited. Each deposit is returnable at the end of the deposit period when evidence of acceptable expenditures on exploration work has been furnished.

For the purpose of expenditures, up to 20 permit areas may be grouped providing:

- At least a part of each permit area lies within any circle of a 50-mile radius.
- Or that the permit areas are contiguous.

A permittee may lease up to 35 percent of his permit area provided he has made certain minimum expenditures on exploratory work. Leases may also be obtained, on lands not already held under permit or lease, by application or competitive bid. Term of a lease is 21 years, and may be renewed for successive periods of 21 years, providing the leased area is capable of producing oil or gas.

Area of a lease may range in size from a minimum of 640 acres to a maximum of one-half of a grid area (about 32,000 acres near the 60th parallel). A survey is required to accurately define the boundaries. Rentals on leased areas are payable in advance at the rates of 50 cents an acre for the first year and a dollar an acre each succeeding year.

Drilling should commence on the leased area within three years after its being granted, and each additional well must be begun within a year of the abandonment of the preceding well. For this purpose, leases may be grouped up to a maximum area of 22,400 acres. Grouping terminates upon the discovery of oil or gas in commercial quantity, but leases without commercial production may be regrouped.

Provision is made whereby the Minister of Resources and Development may exercise discretionary power in development drilling requirements.

Sections of the regulations provide for arrangements for entry on land already held under terminable grants or under patent. However, amount of territorial land favorable for oil exploration held in this manner is almost negligible.

During the first three years of production, royalty of 10 percent is payable to the government, after which the normal rate is 12½ percent. These rates may be reduced should conditions warrant a reduction.

**Conservation.** Under the direction of the Lands Division, exploration, development and production programs of the oil industry in the Territories are supervised through the office of the petroleum conservation engineer, Department of Resources and Development at Edmonton, Alberta.

A permittee or lessee must notify the conservation engineer of any proposed exploratory program. Drilling, abandonment and reconditioning programs require his approval. Daily drill reports, cuttings samples and any core samples designated by the conservation engineer must be sent to him; on completion of any exploratory or drilling program, copies of all factual data must be submitted. Much of this information is forwarded to the Subsurface Office of the Geological Survey of Canada, at Calgary, Alberta, for filing or logging and for eventual release to the public.

After completion or abandonment, data submitted on a wildcat well will not be released for one year. For other wells, it will not be released for 30 days. All other information, including that on stratigraphic or structure test holes, furnished by a licensee or permittee shall not be released until one year after the termination of the last renewal of the license or permit.

Provisions are made in the regulations for prevention of waste and for safety around production plant. No rules pertaining to spacing units or allowables for producing wells have yet been devised. However, it is expected that attention will be given to drafting more comprehensive production regulations in the near future. The only producing field in the Territories, at Norman Wells, held by one company, maintains a high standard of conservation.

**Conclusion.** Northern Canada has vast areas of post-pre-Cambrian igneous rocks which hold promise of future oil production. The region is beginning to receive considerable attention from oil companies. Although remoteness and high transportation costs offer obstacles to exploration and development, liberality of new regulations tend to offset these disadvantages and offer incentive to oil companies pioneering in this exploration.

Copies of Territorial Oil and Gas Regulations and of a map showing permit areas held in the Territories can be obtained from the Lands Division, Department of Resources and Development, Ottawa, Ontario, or from the petroleum conservation engineer for the Northwest Territories and Yukon Territory, Department of Resources and Development, Edmonton, Alberta. **—The End.**

**About the Author**

DR. ARTHUR B. IRWIN recently was named petroleum conservation engineer for the Northwest Territories and Yukon Territory. He is a 1937 graduate of the University of British Columbia where he studied mining engineering. Following graduation from college he spent more than three years with Anglo American Corporation of South Africa on mineral exploration in northern Rhodesia and Nyasaland. During World War II he served with the Royal Canadian Engineers. He obtained his M.S. degree at the University of British Columbia in 1947 and his Ph.D. at McGill University in 1950. He joined the Geological Survey of Canada in 1950. He is now headquartered at the Macdonald Hotel, Edmonton, for his field work in northern Canada.

**IF RIG BUILDING** is one of the industry's coldest jobs, drilling is runner-up. To combat Canada's cold, the derrick floor should be boarded up to a height of about 18 feet. The monkey board on a "winter-tight" rig is boarded in from four feet below derrickman's platform to 12 feet above.

**TWO BUTTONED-UP,** gloved drilling crewmen, with parkas beneath their helmets, are using break out tongs while spinning out of the hole with the rotary table. Working at right in this scene of frigid drilling operations is reportedly the only Chinese member of a Canadian drilling crew.

Photos courtesy D. L. Cuthbert, Producing Department. Imperial Oil Limited, Calgary, Alberta, Canada.

# When the Ice Cometh, Man!

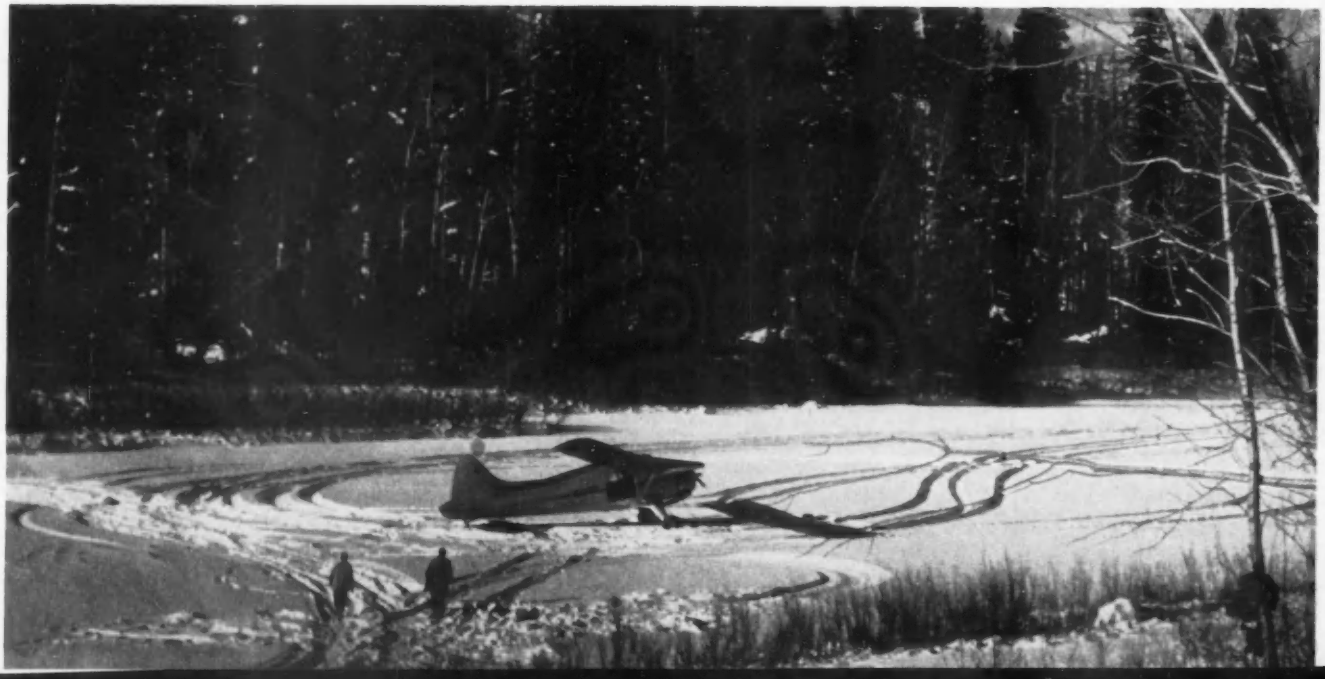
STRANGE AS IT may seem, cold weather in Canadian areas actually helps some operations by freezing muskeg that would otherwise trap heavy equipment. But the cold takes its toll of men and equipment: to withstand below-zero temperatures, the personnel on bush country locations work under "wraps"—oftentimes, several layers of clothing; complications occur when machinery grows brittle in the intense cold. Between latitudes 55° and 60° north, the temperature varies from zero, or slightly above, to as low as —60° F in the cold season. Occasionally, it may remain about —35° or —40° for three or four weeks at a time.

In winter operations, slowdowns are to be expected also because of the rigging up and tearing out of special equipment. Generally, these slowdowns account for 10 to 15 percent of the total drilling time.

*—From a paper presented by D. L. Cuthbert, Imperial Oil Limited, Calgary, Alberta, Canada, at the 41st National Safety Congress and Exposition, Chicago, October 19-23.*

**ICY STALACTITES** on lines in the cellar of this drilling rig are proof aplenty of the obstacles faced on a Canadian operation.

**LANDING STRIPS** are cleared close to locations in remote areas to make it possible for planes to move sick and injured persons and to fly in small equipment. In addition, roads may be blocked for days after a prolonged blizzard.



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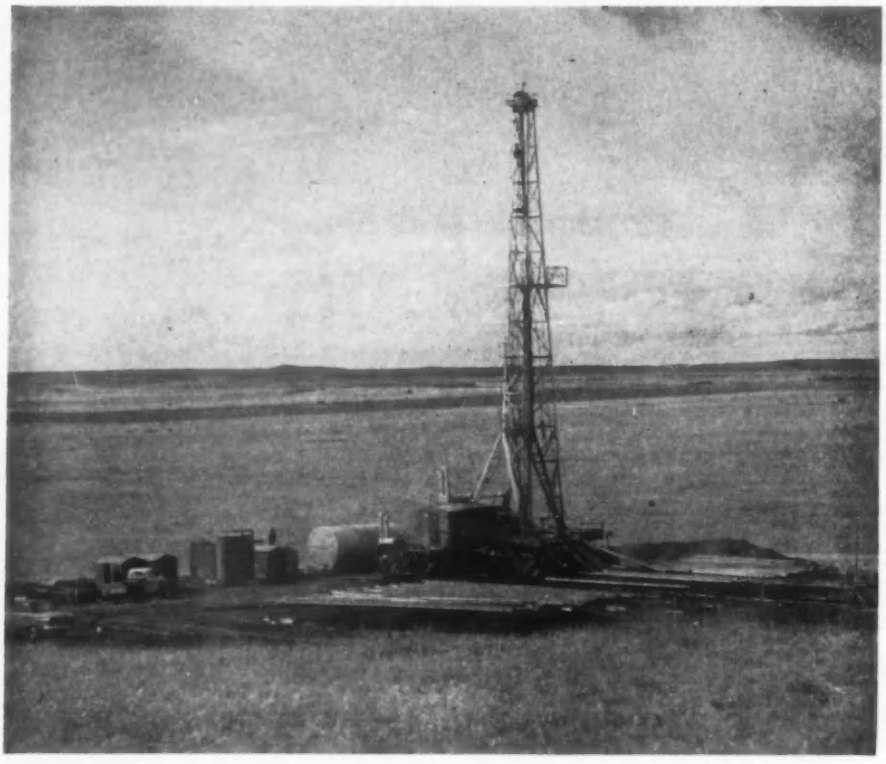


**DRILLING WELL** in the Success field of southwestern Saskatchewan, which produces medium gravity crude from Jurassic formation.

# Will Saskatchewan Discover Its Own Leduc?

**• An air of expectancy hovers over parts of the province despite lack of spectacular results.**

**• If and when a large field is found, it could come from one of four horizons.**

**By F. H. EDMUNDS,** Professor of Geology,
University of Saskatchewan, Saskatoon

FOR SEVERAL years heavy oil has been produced in western Saskatchewan at Lloydminster and adjacent districts. The heavy oil development, though of considerable magnitude, has not attracted a great deal of attention because of the more spectacular developments of light oil in Alberta.

But with the discovery of both medium and light gravity oil during 1952 and the proving and development of considerable reserves of medium gravity oil in 1953, Saskatchewan now takes its place as an important oil producing province.

In 1934 the first well of commercial importance was drilled at Lloydminster. This was a discovery gas well and provided gas for that town for a number of years. It also stimulated further exploration drilling which resulted in several more gas discoveries and gave evidence of heavy black oil. But it was not until 1944 that National Grant 1 became Saskatchewan's first producing oil well.

Since 1944 there has been a steady development in the Lloydminster area with the discovery of a number of pools. Average daily production of the Saskatchewan part of the Lloydminster field was about 4000 net barrels in July of this year, and the cumulative production is now more than 7 million barrels. The ratio of discoveries to wildcats in the Lloydminster area has been about one in three or four. In the following discussion of drilling discoveries in Saskatchewan, none of the figures for the Lloydminster field is used.

Two minor gas discoveries were made in the east side of the province in the late '30s—at Bartwell and Kamsack. Gas is shallow at both places and the producing horizon is a shale near the top of the Colorado. At Kamsack the wells are about 180 feet deep and several have provided a small supply for the town.

In 1944 gas was discovered at Unity in western Saskatchewan, south of Lloydminster, and there a small field has been developed. Gas from the Unity field supplies the town and also the Prairie Salt Company's plant. This plant was established to develop Devonian salt which was discovered by exploratory oil and gas drilling.

These developments were the only ones in Saskatchewan prior to the beginning of the present intensive explorations which commenced in 1949. However, Imperial Oil Company's exploration between 1942 and 1946 had included the drilling of 14 deep test wells which, in addition to providing important stratigraphic data, had given indication of oil in the Mississippian of southeastern Saskatchewan and gas in the Jurassic at Swift Current toward the southwest. From 1949 to the present time there have been 15 gas and 28 oil discoveries.

**Discovery Ratio.** Complete information with regard to drilling for the current year is not readily available but there is sufficient data to give a reasonably reliable picture. The drilling activity has been relatively greater this year than it was last year

and there has not been quite as high a ratio of discoveries.

| | Total Wells | DEVELOPMENT WELLS | | Wildcats | Discoveries |
|---|---|---|---|---|---|
| | | Lloydminster | Other Fields | | |
| 1952 | 496 | 147 | 94 | 255 | 26 |
| 1953(8mos.) | 492 | 85 | 240 | 167 | 12 |

The success ratio for the first eight months of 1953 has been about one in 14 as compared with one in ten in 1952. The 1953 discoveries do not include those at Frank and Smiley, which were announced in September, nor the Bobjo Williston Forget discovery, which was located about three miles northeast of the Tide Water Forget discovery well. The 12 discoveries include 11 oil wells (two light and eight medium) and one gas well. In addition to these discovery wells, several wildcats with important shows justify further tests in the respective areas.

In southeastern Saskatchewan the Socony-Vacuum St. Antoine was abandoned after failing to obtain commercial production from the Mississippian. The well swabbed about ten barrels of oil per day. In the same general part of the province, Shell Estevan 1 and Shell Minard A-1-4 showed the presence of oil, the former would probably have produced oil in noncommercial quantity and the latter had abundant staining but the formation was too tight for commercial production.

In southcentral Saskatchewan a well has been drilled which obtained oil staining in the Devonian, Silurian and Ordovician beds, but no oil recovery was obtained on drillstem tests. In southwestern Saskatchewan where The Amurex Albercan group has drilled about eight tests considerably west of the Gull Lake-Midway area, two wells have proved discoveries—Frank and Moser—and other wells had oil staining in the Jurassic. Evidence of heavy oil was obtained in a well at Battle Creek in the extreme southwest part. The oil was in Mississippian beds, but was not commercial.

**Geology and Oil Trends.** Recent discoveries in Saskatchewan have been principally those in the Jurassic of the southwest and the Mississippian of the southeast. Both Jurassic and Mississippian beds are truncated on the flanks of the Williston Basin, which extends into Saskatchewan from North Dakota and eastern Montana.

In Saskatchewan the extension of the Williston Basin has long been known as the Moose Jaw Basin and the regional structure is one of dip to the south and southeast towards this

**TABLE 1**

**Oil and Gas Discoveries in Saskatchewan**

| AREA NAME | LOCATION | | | Status | Producing Geological Age | Horizons Lithology | Approx. Depth to Producing Zone | Effective Maximum Thickness | Capacity Average Well | API |
|---|---|---|---|---|---|---|---|---|---|---|
| | Twp. | R. | Mer. | | | | | | | |
| Battle Creek | 3 | 26 | W3 | Gas | Jurassic | Calc. Sst. | 4200 | 15 | 6500 mcf/d | ..... |
| Bertwell | 42 | 4 | W2 | Gas | Cretaceous | Shale | 220 | 10 | 10 mcf/d | ..... |
| Brock | 28 | 21 | W3 | Gas | Cretaceous | Viking sand | 2300 | 10 | 11000 mcf/d | ..... |
| Buffalo Coulee | 32 | 24 | W3 | Gas | Cretaceous | Viking sand | 2300 | 5 | 500 mcf/d | ..... |
| Buffalo Coulee | 32 | 24 | W3 | Oil | Mississippian | Banff sand | 2650 | 20 | 40 bbls/d | 11° |
| Cantuar | 16 | 17 | W3 | Oil | Cret.-Jur. | Cantuar sand | 3100 | 30 | 200 bbls/d | 12°—23° |
| | | | | | Jurassic | Roseray sand | 3300 | 20 | ..... | ..... |
| Coleville | 31 | 23 | W3 | Gas | Cretaceous | Viking sand | 2200 | 20 | 5000 mcf/d | 10°—18° |
| | | | | Oil | Mississippian | Banff sand | 2650 | 40 | 60 bbls/d | ..... |
| D'Arcy | 28 | 19 | W3 | Gas | Createceous | Viking sand | 2300 | 10 | 2500 mcf/d | ..... |
| Dodsland | 32 | 20 | W3 | Gas | Cretaceous | Viking sand | 2200 | 5 | 800 mcf/d | ..... |
| *Dollard | 7 | 20 | W3 | Oil | Jurassic | Calc. sand | 4530 | ? | I.P. 270 bbls/d | 23.5 |
| Driver | 31 | 24 | W3 | Gas | Cretaceous | Viking sand | 2200 | 20 | 5000 mcf/d | ..... |
| Eagle Hills | 40 | 15 | W3 | Oil | Cretaceous | Sand | 2200 | 17 | 6 bbls/d | 12°—15° |
| Eastend | 6 | 20 | W3 | Oil | Jurassic | Lmst. & Calc. Sst. | 4700 | 30 | 110 bbls/d | 22°—23° |
| Eatonia | 26 | 24 | W3 | Oil | Cretaceous | Detrital | 2950 | 40 | 38 bbls/d | 11°—13° |
| Elrose | 26 | 16 | W3 | Gas | Cretaceous | Viking sand | 2100 | 5 | 1000 mcf/d | ..... |
| Eureka | 31 | 23 | W3 | Oil & Gas | Cretaceous | Viking sand | 2250 | 20 | 1500 bbls/d | ..... |
| | | | | | | Cret. sand | 2475 | 14 | 75 bbls/d | 15° |
| *Forget | 9 | 7 | W2 | Oil | Mississippian | Limestone | 3900 | 20 | 500 bbls/d | 29½° |
| Fosterton | 17 | 18 | W3 | Oil | Cret.-Jur. | Roseray sand | 3100 | 60 | 250 bbls/d | 24° |
| *Frank | 16 | 27 | W3 | Oil | Jurassic | Sand | 3270 | ? | ..... | 13° |
| *Frontier | 3 | 20 | W3 | Oil | Jurassic | Calc. Sst. & Lmst. | 4500–4600 | 15 | 50 bbls/d | 20°—22° |
| Gull Lake | 13 | 19 | W3 | Gas | Cretaceous | Sand | 3700 | ? | 5000 mcf/d | ..... |
| | | | | Oil | Jurassic | Lmst. & Calc. Sst. | 3950 | 27 | 60–100 bbls/d | 23° |
| Hearts Hill | 35 | 26 | W3 | Oil | L. Cret. | Sand | 2685 | 10 | ? | 14° |
| Hoosier | 31 | 28 | W3 | Oil | Cretaceous | Detrital | 2800 | 16 | 100 bbls/d | 15° |
| *Java | 15 | 15 | W3 | Oil | Cret.-Jur. | Sand | 3228 | 25 | 75 bbls/d | 21° |
| Kamsack | 28 | 32 | W1 | Gas | Cretacecus | Shale | 180 | 15 | 10 mcf/d | ..... |
| *Leon Lake | 3 | 21 | W3 | Oil | Jurassic | Lmst.-Calc.-Sd. | 4485 | ? | ? | 22° |
| †Lloydminster | 49 | 28 | W3 | Gas | L. Cret. | Sand | 1700 | 10 | 3000 mcf/d | ..... |
| | | | | Oil | L. Cret. | Sand | 1800 | 30 | 20 bbls/d | 12°—14° |
| *Loomis | 3 | 21 | W3 | Oil | Jurassic | Lmst.-Calc.-Sd. | 4580 | ? | ? | 20° |
| *Midale | 6 | 10 | W2 | Oil | Mississippian | Limestone | 4590 | ? | 400 bbls/d | 27° |
| *Midway | 15 | 19 | W3 | Gas | Jurassic | Calc. Sst. | 3400 | 15 | 7000 mcf/d | ..... |
| | | | | Oil | | | 3500 | 15 | 200 bbls/d | 22° |
| *Mosier | 14 | 25 | W3 | Oil | Jurassic | Sand | 3160 | 10+ | ? | 23° |
| Newberg | 28 | 21 | W3 | Gas | Cretaceous | Viking sand | 2250 | 10 | 3000 mcf/d | ..... |
| *North Gull Lake | 13 | 19 | W3 | Oil | Cret.-Jur. | Sand | 3616 | ? | ? | 21° |
| *North Premier | 15 | 18 | W3 | Oil | Cret.-Jur. | Roseray sand | 3200 | 26 | 400 bbls/d | 23° |
| Onward | ..... | ..... | ..... | ..... | Mississippian | Sandstone | 2650 | 24 | ? | 14° |
| *Rapdan | 4 | 20 | W3 | Oil | Jurassic | Calc. Sst. | 4500 | 24 | 200 bbls/d | 23° |
| Ratcliffe | 1 | 15 | W2 | Oil | Mississippian | Limestone | 6400 | 12 | 35 bbls/d | 31° |
| St. Florence | 30 | 24 | W3 | Gas | Cretaceous | Sand | 2500 | 10 | 21000 mcf/d | ..... |
| St. Eloi | 30 | 23 | W3 | Oil | Cretaceous | Sand | 2500 | 15 | ? | 11°—15° |
| *Smiley | 31 | 25 | W3 | Oil | Cretaceous | Sand | 2310 | 11+ | ? | 32° |
| Success | 17 | 16 | W3 | Gas | Cretaceous | Cantuar sd. | 3000 | 20 | 2000 mcf/d | ..... |
| | | | | Oil | Jurassic | Roseray sand | 3050 | 60 | 200–400 bbls/d | 22° |
| Unity | 39 | 23 | W3 | Gas | Cretaceous | Viking sand | 1650 | 10 | 500 mcf/d | ..... |
| | | | | | Mississippian | Unity sand | 2100 | 30 | 3000 mcf/d | ..... |
| Wapella | 14 | 1 | W2 | Oil | Cret.-Jur. | Sand | 2200 | 20 | 100 bbls/d | 26°—27° |

* Discoveries in 1953.

† The Saskatchewan part of the Loydminster field includes various pools:—Silverdale (Twps. 48, 49—R. 27, 28); Dulwich (Twps. 48, 49—R. 27); Big Gully (Twp. 49—R. 23); Lone Rock, (Twp. 47—R. 27); McLaren (Tp. 50—R. 26); Maidstone (Tp. 48—R. 22); Marsden (Tp. 45—R. 28;) Waseca (Twp. 49—R. 24).

## Stratigraphic Correlation of Saskatchewan Areas

| ERA | PERIOD | EPOCH | LLOYDMINSTER | SOUTHWEST SASKATCHEWAN | SOUTH CENTRAL and SOUTHEAST SASKATCHEWAN | NORTHEAST SASKATCHEWAN |
|---|---|---|---|---|---|---|
| CENOZOIC | QUATERNARY | RECENT | | | | |
| | | PLEISTOCENE | GLACIAL DRIFT | GLACIAL DRIFT | GLACIAL DRIFT | GLACIAL DRIFT |
| | TERTIARY | PLIOCENE | | | | |
| | | MIOCENE | | WOOD MOUNTAIN | | |
| | | OLIGOCENE | | CYPRESS HILLS | | |
| | | EOCENE | | SWIFT CURRENT | | |
| | | PALEOCENE | | RAVENSCRAG | RAVENSCRAG | |
| MESOZOIC | CRETACEOUS | UPPER CRETACEOUS — Montana Group | | FRENCHMAN | FRENCHMAN | |
| | | | | BATTLE | | |
| | | | | WHITEMUD | WHITEMUD | |
| | | | | EASTEND | EASTEND | |
| | | | Montana Group: BEARPAW | Montana Group: BEARPAW | Montana Group: BEARPAW | RIDING MOUNTAIN |
| | | | Belly River: Grizzly Bear | OLDMAN | BELLY RIVER | |
| | | | Belly River: Ribstone | FOREMOST | | |
| | | | LEA PARK | PAKOWKI | LEA PARK | Vermilion River: Pembina, *Boyne, Morden |
| | | | | MILK RIVER | | |
| | | UPPER CRETACEOUS — Colorado Group | Colorado Group: Upper — 1st White Specks | Colorado Group: Upper — 1st White Specks | Colorado Group: Upper — 1st White Specks | |
| | | | Upper — 2nd White Specks | Upper — Medicine Hat | | |
| | | | | 2nd White Specks | 2nd White Specks | FAVEL: Assiniboine Keld |
| | | | Lower | Lower — *Viking | Lower — Viking | ASHVILLE |
| | | | | | Lower — Spinney Hill | |
| | | LOWER CRETACEOUS | Manville (Blairmore): * Colony Sand Member | BLAIRMORE | BLAIRMORE | SAWN RIVER |
| | | | * Sparky Sand Member | | | |
| | | | DINA MEMBER | | | |
| | JURASSIC | | | *VANGUARD (Swift J-1) | *VANGUARD (Swift J-1) | |
| | | | | *SHAUNAVON — Upper — J-2A | SHAUNAVON — Upper — J-2A | |
| | | | | *SHAUNAVON — Lower — J-2B | SHAUNAVON — Lower — J-2B | |
| | | | | GRAVELBOURG (J-3) | GRAVELBOURG 9 (J-3) | |
| | | | | | Davidson (J-4) | |
| | TRIASSIC | | | | | |
| | PERMIAN | | | | SPEARFISH | |
| | Pennsylvanian | | | | | |
| | Mississippian | CHESTER-MERAMEC | | | Big Snowy Group: ? *Charles | |
| | | OSAGE | | Mad. Group: MISSION CANYON | Mad. Group: *MISSION CANYON | |
| | | KINDERHOOK | | Mad. Group: LODGEPOLE | Mad. Group: LODGEPOLE | |
| | | | | BANFF-EXSHAW | EXSHAW-BAKKEN | |
| PALEOZOIC | DEVONIAN | UPPER | | THREE FORKS | Qu'Appelle Group: Lyelton FM. | |
| | | | | POTLATCH | Saskatchewan Group: Nisku Equivalent | |
| | | | Wood bend Group: Cooking Lake FM. | Jefferson: NISKU | Saskatchewan Group: DUPEROW FM. | |
| | | | | Jefferson: WOODBEND GROUP (Cooking Lake) | | |
| | | | BEAVERHILL LAKE | BEAVERHILL LAKE | Manitoba Group (Beaverhill Lake): Dadivson Souris Evaporite River FM. 1st RED | Montana Group: POINT WILKINS |
| | | | Elk Point Group: 1st RED | Elk Point Group: 1st RED | DAWSON BAY FM. | 1st RED |
| | | ? | Elk Point Group: 2nd RED | Elk Point Group: 2nd RED | 2nd RED | 2nd RED |
| | | | Elk Point Group: PRAIRIE EVAPORITE | | Elk Point Group: PRAIRIE EVAPORITE FM. | WINNIPEGOSAN |
| | | MIDDLE | Elk Point Group: WINNIPEGOSAN | Elk Point Group: WINNIPEGOSAN | Elk Point Group: WINNIPEGOSAN | ELM POINT |
| | | | Elk Point Group: ASHERN | Elk Point Group: ASHERN | Elk Point Group: ASHERN | ASHERN |
| | SILURIAN | | UNDIVIDED | UNDIVIDED | STONEWALL | Interlake Group: STONEWALL |
| | ORDOVICIAN | | | | STONY MOUNTAIN | STONY MOUNTAIN |
| | | | | | RED RIVER | RED RIVER |
| | | | WINNIPEG | WINNIPEG | WINNIPEG | WINIPEG |
| | CAMBRIAN | | UNDIVIDED | UNDIVIDED | UNDIVIDED | ? |
| | Precambrian | | | | | |

* Horizons from which gas or oil are being produced.

# "Royal" Men Know Oil

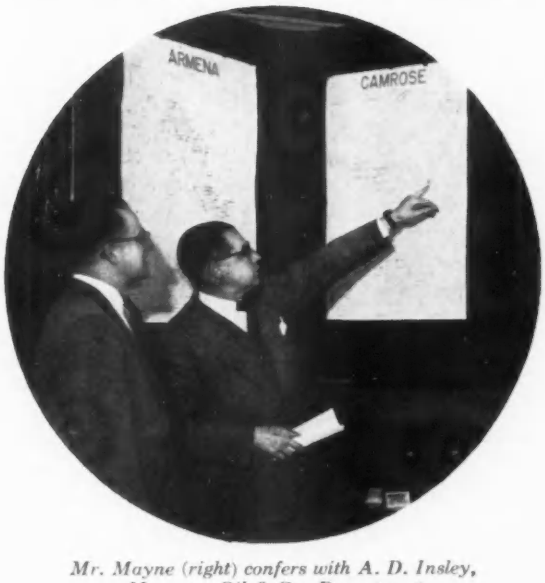
*T. H. Atkinson, General Manager, photographed with a driller at a well near Edmonton, Alta.*



*J. C. Mayne, Alberta Supervisor, and W. A. Hyndman, Manager, Calgary Branch, watch drilling mud flowing over a shale-shaker.*



*F. J. C. Caine, Manager, Edmonton Branch (right), during a visit to a well-head "Christmas Tree".*




*Mr. Mayne (right) confers with A. D. Insley, Manager, Oil & Gas Department*

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basin. The accompanying correlation chart shows the stratigraphical relationships in significant parts of the province. The section for the Lloydminster and the northeastern regions shows the absence of Jurassic and Mississippian beds. In these regions the Lower Cretaceous beds lie directly on the Devonian and there is also truncation of various formations of the Devonian that are present to the west in central Alberta and to the south in southern Saskatchewan.

CRETACEOUS. Cretaceous beds that are of most interest in Saskatchewan are the Viking sand of Lower Colorado age and a number of sands in the Lower Cretaceous. The Viking sand is not well developed in the Lloydminster area but becomes important in the country to the south and east, where considerable gas reserves are present at Coleville and Brock and at a number of other localities in west-central Saskatchewan.

A recent discovery is that of light gravity oil in the Viking at Smiley, near Coleville. Previously, light oil had been found in the Viking at Driver, but there the gas-oil ratio had proved too high for commercial production. These two occurrences of light oil will, it is hoped, stimulate a deserved interest in the Viking.

The Viking sands are present underlying much of Saskatchewan. They are well developed in the Yorkton area on the east side of the province. Two wells drilled last year, northwest of Yorkton, found shows of gas, but drillstem tests recovered slightly gasified water.

Heavy black oil is present in Lower Cretaceous sands of the Lloydminster and adjacent areas of west-central Saskatchewan. Several pools have been developed some distance east of Lloydminster, and good shows have been obtained in wildcat wells as much as 100 miles southeast of Lloydminster. It seems probable that there are very large reserves to be discovered.

Medium gravity Lower Cretaceous oil has been recovered from wells in the Cantuar-Fosterton area. Discovery last year of medium oil in the Lower Cretaceous of the Wapella area gave the first evidence of the possible importance of the Lower Cretaceous in eastern Saskatchewan.

JURASSIC. In January, 1952, Socony-Vacuum Exploration Company completed Saskatchewan's first medium crude well in the Fosterton area west of Swift Current. Following this discovery, exploration and drilling activity greatly increased. Several new fields were found. Up to the present, there are ten distinct areas, four of which have been developed to a significant extent.

In all, about 150 wells are producing or are capable of production in the various fields. The crude in this district is principally from sands in the upper part of the Jurassic, although there is some production from the basal Cretaceous. The most important sands are the Cantuar and Roseray of the Vanguard formation.

In 1952 Tide Water Associated found medium gravity oil in the Eastend area of southwestern Saskatchewan. Further exploration by Tide Water has resulted in the discovery of oil in areas both south and north of Eastend. Producing horizons are stratigraphically below those of the Fosterton-Cantuar district to the north and are in beds of the Gravelbourg formation, which is equivalent to the Piper of Montana.

Gas at Battle Creek in the extreme southwest part of the province is Jurassic as are the oil discoveries at Moser and Frank, west of the Fosterton district. In the latter wells the oil is in Piper equivalents.

MISSISSIPPIAN. In the central part of the Williston Basin in North Dakota, Tioga and Beaver Lodge fields illustrate the commercial importance of Mississippian beds. Various formations of the system extend into Saskatchewan and subcrop successively toward the north. Medium to light oil discoveries have been made in the Mission Canyon formation underlying southeastern Saskatchewan, notably in the Socony Ratcliffe, Shell Midale and Tide Water Forget wells.

The Mississippian beds not only subcrop successively to the north but also there is thinning in that direction. At least two porous oilbearing horizons are present, one at the top of the Mission Canyon, or base of the Charles, and the other lower in the section. Considerable attention is being paid to the subsurface geology in these formations and attempts made to decipher the topography of the subcrop areas.

DEVONIAN AND OLDER BEDS. Discovery of oil or gas has yet to be made in pre-Mississippian beds of Saskatchewan. Oil shows have been obtained in Devonian, Silurian, and Ordovician beds, but relatively few wells have penetrated them completely. Ten wells have penetrated to the Pre-Cambrian, 33 have reached the Winnipeg sand or the Ordovician limestones, 18 have bottomed below the base of the Silurian and 33 in the Interlake Group of the Silurian. Thus, 95 wells have passed through the complete section of Devonian—too small a number, in this vast area, to test the possibilities of the Devonian at all adequately.

The Devonian is of interest because of its abundant productivity in Alberta, however the top part of the Devonian which is so productive in Alberta is missing underlying much of Saskatchewan. Nevertheless, there is a fairly thick sequence which is up to more than 1800 feet; locally, it includes 400 feet of salt and associated evaporites, 200 feet of clastics, 800 feet of carbonates and 300 feet of organic reef material. It is considered that the system has prospects as also have the underlying Silurian and Ordovician, but exploration is likely to be slow because of the relatively great expense of drilling.

Unfortunately, seismic reflections from these deeper beds have been poor, and little evidence of good structure has been obtained. In the belt underlain by the Devonian evaporites, there are fairly common structures which are evident in geological and seismic investigation but which are not present below the evaporites.

**Reserves, Cost of Exploration.** Widely divergent estimates on reserves have been made and too little is known about the reservoir conditions to allow more than a guess as to the recovery factor for the medium gravity fields.

Reserves of medium gravity crude in place are estimated at about 620 million barrels. And if a 30 percent recovery factor is taken, the proven recoverable reserve is 185 million barrels. Recoverable reserves of heavy black oil, including those of Lloydminster and the Coleville areas, are estimated at about 65 million barrels. No estimate is made for the light gravity crude so that the total is 250 million net barrels.

An idea of the cost of finding this oil may be obtained from estimates of expenditures by the Saskatchewan

Department of Mineral Resources. The estimates are of total expenditures including those for exploration and drilling on freehold as well as crown lands and for development drilling.

| | |
|---|---|
| 1949 | $ 5,000,000 |
| 1950 | 8,000,000 |
| 1951 | 17,000,000 |
| 1952 | 31,000,000 |
| | $61,000,000 |

If to the $61 million an additional $30 million is added as the possible expenditure for the current year, a figure of $91 per 250 barrels, or 36 cents per barrel is obtained. Naturally, the cost of finding a barrel of oil varies. With one successful company it has been about ten cents, with other companies it has been $1 per barrel, or more.

**Acreage Situation.** Much of the oil and gas acreage in Saskatchewan is the property of the Government (Crown) and is administered by the Provincial Department of Mineral Resources. The majority of this acreage has been let out on exploration permits held by various companies. Most of the companies are willing to make farmout agreements and, during 1953, much exploration has been carried out by groups who have obtained such farmouts from the original permit holders.

In the first permit agreements made with the government, 25 percent of the acreage was retained by the Crown as a reserve. At present, a permit covers all the Crown acreage in a given area and the conditions are such that a proportion becomes a Crown Reserve after successful exploration. Recently, the government put up reserve acreage for sale. This marks the first sale of Crown reserve in Saskatchewan and in September bids on eight quarter sections of 160 acres each were accepted.

The eight parcels are in the Fosterton and Success fields of southwestern Saskatchewan. The highest bid for one parcel was for $813,111 by Sohio Petroleum. The total brought in was $2,531,074 for the eight parcels.

Factors governing acquisition of acreage in Saskatchewan are:

- Exploration permit acreage can be obtained from the government when permits are put up for sale.
- Farmouts of permit acreage can be obtained from various permit holders.
- Bids can be made for proved or semi-proved Crown reserves when these reserves are put up for auction.
- Freehold acreage can be bought, or farmouts obtained of freehold rights where or when available.

Most of the acreage, both permit and freehold, is fairly tightly held at the present time and probably the best way to get into the Saskatchewan play is by taking farmout acreage.

**Present and Future.** Although Saskatchewan discoveries up to now may not have been spectacular, exploration can be considered to have been satisfactory and the results encouraging. Progress has been steady, and there is a general feeling of optimism among the exploration groups.

The Jurassic trend in the southwest has proved highly satisfactory, and the Mississippian trend in the southeast is being developed and gives promise of proving considerable reserves of light gravity oil. There are likely to be abundant reserves of heavy black oil in the westcentral part where both Lower Cretaceous and Mississippian beds are the reservoirs. In the west, south and east areas, the Viking of Upper Cretaceous age is present and has good possibilities of being gas-bearing and has prospects of its holding reserves of light gravity oil.

Seismic survey and subsurface geological work have proved the most successful exploration tools. It is, perhaps, significant that successful discoveries in the Fosterton-Cantuar area have been in localities where both seismic and shallow structural drilling surveys have been made and have both shown anomalies.

However, it is not in all parts of Saskatchewan that these methods can be used with satisfactory results. Seismic reflections from deep horizons have not proved satisfactory and some investigations are being carried out on methods to try and get better deep records.

A matter for disappointment has been the lack of success of Devonian exploration, particularly in the northeastern part of the province where good reef conditions and good porosity are known to exist and where the depth of the basement is not excessive. This disappointment has caused a general slackening of interest in the north part of the prairie region where there are no Jurassic or Mississippian beds. The writer does not consider that neglect in exploring this part of the province is justified; too few wells have drilled to condemn either the Lower Cretaceous, Devonian or deeper possibilities.

The feeling of disappointment among geologists is one of frustration that exploration methods are not yielding results that it is thought they should. There is an expectancy that shortly a spectacular discovery will be made, one that will lead to the interpretation of the data that is being accumulated and lead to an acceleration of discovery. Saskatchewan has not yet discovered its 'Leduc'. The question waiting to be answered is: Will it prove to be Mississippian, Devonian, Silurian, or Ordovician?

The production of future months will, however, depend upon finding a market for the crude. This may not prove difficult, but it is important that exploration keep up its pace and even increase so that more reserves are discovered—reserves of a magnitude to justify expenditures for pipe lines and refineries that will be necessary in establishing a market.

**—The End.**

## About the Author

F. H. EDMUNDS, professor of geology at the University of Saskatchewan, was born in North Wales. He received his B.S. degree in petroleum technology and his M.S. in geology from Liverpool University. In 1925 he came to Saskatchewan as assistant professor of soil and was engaged for a number of years on soil survey. After joining the Geology Department he carried out various investigations and surveys for the Department of Natural Resources, and recently has done consulting work relating to the present oil and gas exploration activity. In 1952 he was appointed a member of the Saskatchewan Oil & Gas Conservation Board.

Fig. 1—Hydraulically-operated, electrically-controlled one-inch, 1000-pound valve.

Fig. 2—Weatherproof control box for valve at each well.

# 'Weathered-In' Lease Problem Being Whipped

**Further savings and protection results from Canadian test of automatic operation of flowing wells and tank battery.**

**By M. R. TAYLOR,** Gulf Oil Corporation, Tulsa

THE SKOW UNIT lease in the Stettler Pool, province of Alberta, is the first Canadian oil-producing lease to be operated exclusively with automatic controls.

Well allowables for this pool are small, in the range of 40 to 50 barrels a day and maximum permissive rates of only 75 to 90 barrels daily do not allow large amounts of production. The wells are generally not capable of flowing at a sustained low rate of 2 to 3 barrels per hour.

Therefore, a number of leases in this area, as well as in other fields in Canada in which the flowing of the allowable in accordance with provincial regulations requires opening and closing of all wells each day, represent desirable conditions for the installation of automatic controls.

Application of fully automatic equipment in Canada has a desirable aspect which is difficult to evaluate in dollars and cents. Extremely cold winters and the possibility of the lease being snowed in or inaccessible for several days at a time necessitate some type of control which will automatically shut in wells when the available tank room has been filled.

Needless to say, sizable losses would be sustained if the leases could not be reached during adverse weather to switch tanks or shut in the wells when tank space is not available. Another saving to be realized with automatic controls is the reduction in operating labor. They relieve the pumper from the many routine operations of opening and closing the wells and switching tanks. This provides more time for general lease maintenance work. The value of safety devices incorporated with the control equipment cannot be overlooked, as they are constantly guarding against the overfilling of tanks and also provide some protection against equipment failures.

Automatic controls for the eight wells on the Skow Unit lease include individual electrically operated well valves which are opened and closed by time-clock controls. In this manner, wells may produce allowables in succession on a fixed schedule. Automatic tank-battery controls include a tank switcher which allows the three stock tanks on the lease to be filled in rotation automatically, and incorporate the necessary equipment to skip full tanks, tanks being run by the pipe

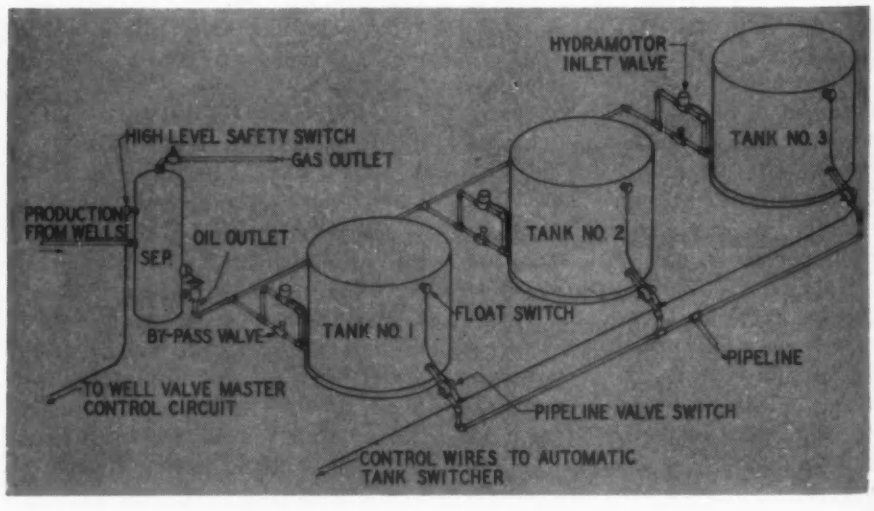


Fig. 3—Diagrammatic sketch of automatic tank battery.

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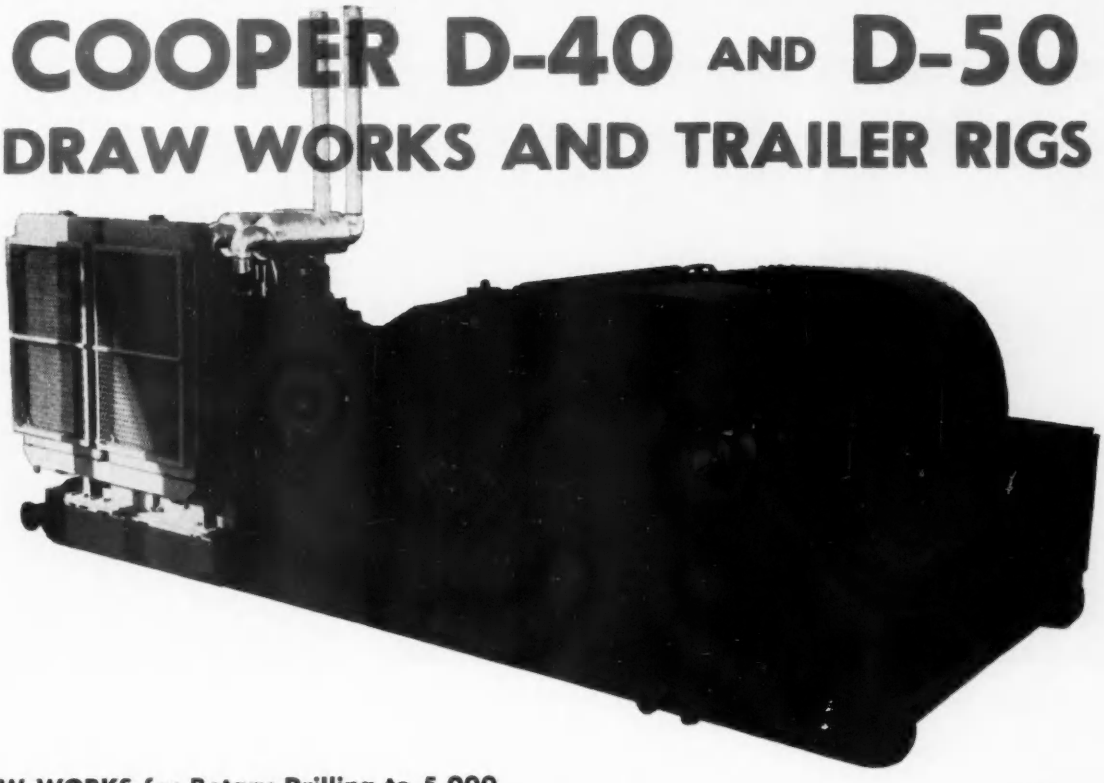

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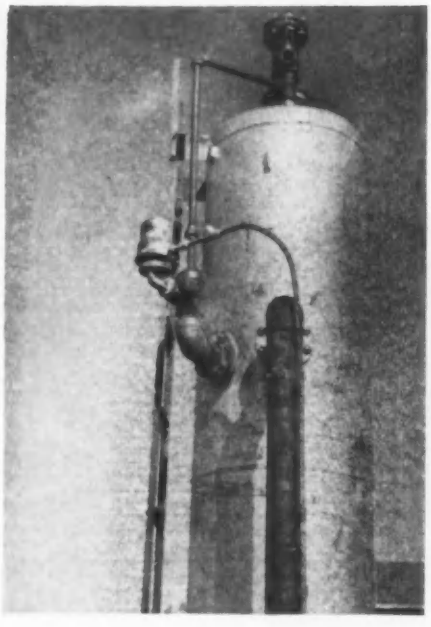

Fig. 4—High-level safety float switch in gas-oil separator.

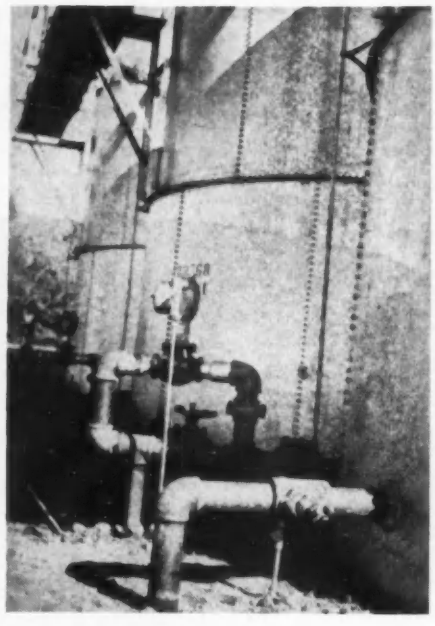

Fig. 5—Electrically-controlled, hydraulically-operated stock tank fill valves.

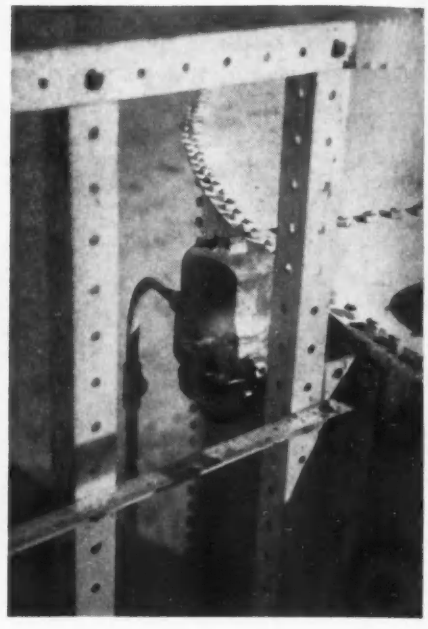

Fig. 6—High-level float switch on stock tank.

line, or tanks out of service. Safety devices stop all flow in case of power or equipment failure.

**Well Control.** To obtain individual control, electrically operated valves were installed at the wells. This was necessary as the wells are produced through trunk lines. An individual control system is desirable because it eliminates the necessity of subjecting gathering lines to full wellhead pressure.

A 1-inch control valve, Figure 1, was installed at each well, utilizing a by-pass arrangement for easy removal in the event of mechanical failure of the valve. Weatherproof control boxes, Figure 2, containing necessary controls for operation of the electric valve, were installed at each well. Each box contains a 440-volt multi-breaker switch, a 440-volt to 110-volt, 250-kva transformer, a 110-volt time switch, and a lightning arrester.

Automatic opening and closing of each valve is accomplished by the automatic time switch in the individual well control panel. The time switch, which has a 24-hour dial, opens the valve once each day for approximately a 2-hour flowing period. Each well is closed in automatically after flowing its allowed production.

It is possible to arrange the flowing time of the wells according to any desired schedule. Wells may be set up so that several flow simultaneously, or they may be set to flow consecutively.

Fig. 7—Pipe line discharge valve and switch.

Since the combined flowing periods last only 10 to 12 hours, the wells are set to flow consecutively.

**Tank Control.** Wells flow into a common header and through an oil and gas separator into the stock tanks. The complete tank battery, including separator, stock tanks, valves, float switches, and piping is shown diagrammatically in Figure 3. A float switch, Figure 4, was installed above the normal oil level in the separator as a safety precaution. In the event the discharge valve freezes shut, or any obstruction stops the flow to the tanks, the float switch energizes a relay to shut the wells in. A similar float switch will be installed in the heater treater when treatment of the well fluid is deemed necessary.

Oil flows into each stock tank through a 3-inch electrically operated valve, Figure 5, which is connected to the inlet in the bottom of the tank. Other controls on the individual stock tanks include a float switch, Figure 6, and a pipe line discharge valve switch, Figure 7.

The various control devices at the tank battery enable the following functions to be accomplished:

- Tanks are automatically filled in numerical order.
- Any unfilled tank may be by-passed by a manual selector switch.
- Full tanks are automatically by-passed.
- When all tanks are full, power to all flowing wells is interrupted, which closes the electric valves at all wells flowing into the system. Time switches at all wells are de-energized until tank room is again available.
- When a tank is being run to pipe line, it is automatically bypassed as long as the pipe line discharge valve is open.

Coordination of all control functions is accomplished by a tank

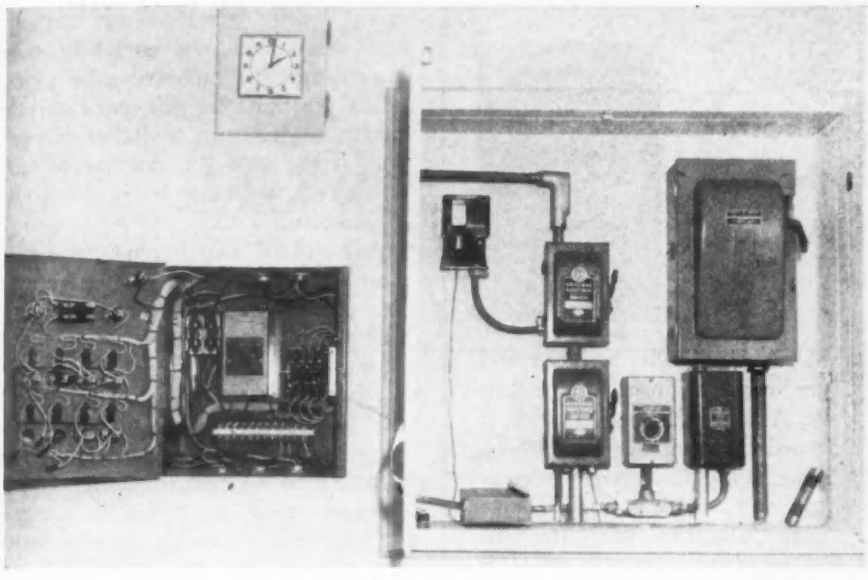

Fig. 8—Electric tank switcher and related control equipment in control house.

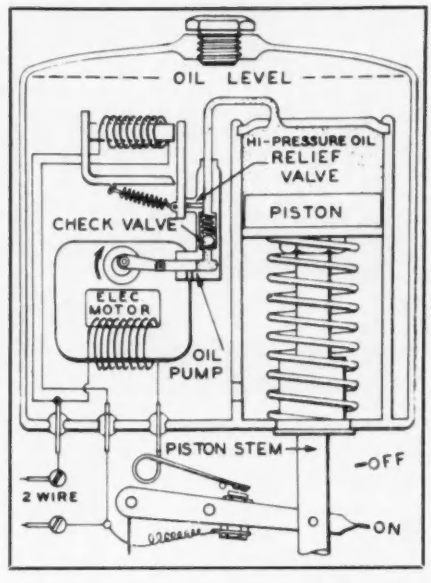


Fig. 9—Electrically-controlled, hydraulically-operated valve operator.

switcher located in the control house. When tank room is available, the control circuit in the tank switcher is energized and the electric inlet valve on the first available tank is opened. A light on the switcher indicates the tank inlet valve is open. As soon as the tank is filled, the float switch raises and energizes the motor in the tank switcher. The motor operates a cam mechanism that trips a microswitch for each tank circuit until the next available tank is found.

The switching sequence stops until the next tank is filled, and the cycle is repeated. The pipe line discharge valves act in the same manner as the float switches to energize the tank switcher motor so that production may be switched into the next available tank.

When all tanks are full, the switcher shuts the flowing wells in. This is accomplished through a time-delay relay which de-energizes a standard control relay connected to the field circuit. The tank switcher and related control equipment are shown in Figure 8.

Indicator lights are provided on the tank switcher to indicate:

- When tank is being filled.
- When the tank switcher is energized.
- High level in the separator.
- When tank room is not available.

A two-wire, 440-volt, single-phase line was constructed to each well to facilitate control of the individual well valves from the tank battery control house. The 440-volt system was utilized to allow for any excessive voltage drop, as control lines in excess of one mile were necessary for some wells.

Special electric explosion-proof motor valves were furnished by the manufacturer for control valves at the wells and the inlet valves at stock tanks. Globe-type valves with stainless steel trim were used.

The valve stem is connected directly to the hydraulic piston on the valve operator, Figure 9. Spring action closes the valve while a small direct-connected, motor-driven hydraulic pump creates the pressure necessary to depress the piston and spring to open the valve. An electromagnetic relief valve in the feed line to the hydraulic cylinder is closed when a small amount of current flows through that circuit. Approximately 9 kva at 110 volts is required to hold the relief valve in the closed position.

The motor and relief valve are connected in parallel. When the valve is energized, the piston is depressed

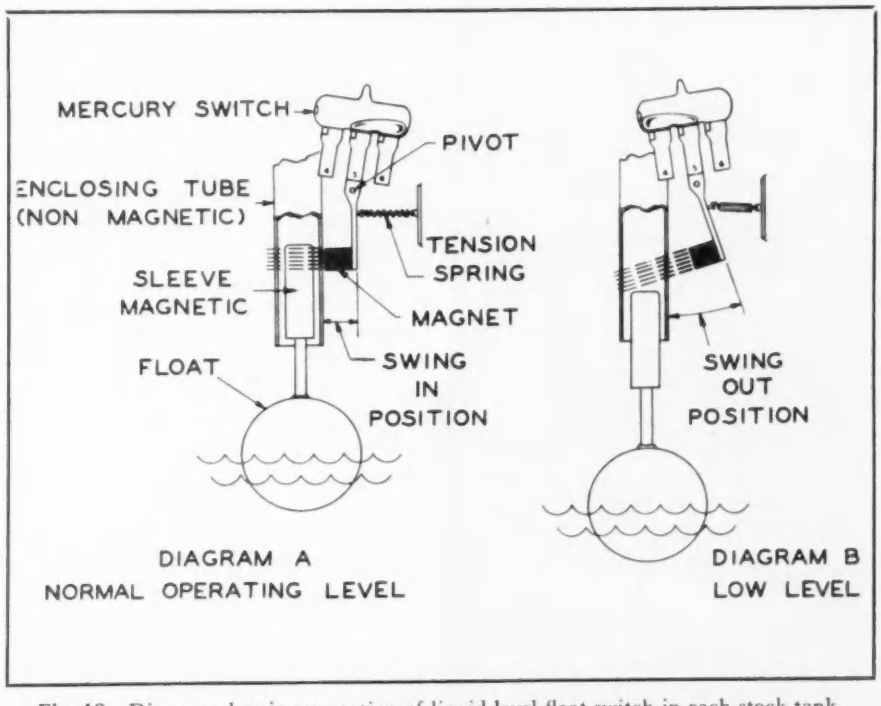


Fig. 10—Diagram showing operation of liquid-level float switch in each stock tank.

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## About the Author

M. R. TAYLOR, assistant area production engineer for the Kansas Area, Gulf Oil Corporation, joined the company in 1948. He received a B.S. degree in mechanical engineering from Kansas State College in 1948, after having spent three years in the U. S. Navy during World War II. Taylor worked as student engineer in various capacities, being promoted to production engineer in 1950. In 1952, he was made senior mechanical engineer in the Tulsa Production Division office, and in 1953 was promoted to his present position. A considerable portion of his work as a senior mechanical engineer was devoted to the application of automatic controls and automatic equipment to production operations.

until it trips the integral switch which de-energizes the circuit to the motor, and movement of the stem stops. The valve is held open by liquid trapped in the cylinder until the circuit to the operator is broken. At this time, the relief valve opens and fluid flows back into the reservoir, allowing the spring action to close the valve.

An explosion-proof liquid-level float switch in the side of each stock tank opens and closes circuits that switch the flow to the next available tank. Diagrams A and B, Figure 10, schematically illustrate the operating principle.

In the tank full position, as shown in Diagram A, the float has pushed the stainless steel magnetic sleeve into the magnetic field of the magnet. In this position, the mercury switch maintains a closed electrical circuit to the tank switcher so that it will energize the motor in the switcher to by-pass the tank.

When the low-level position, Diagram B, is reached, the sleeve has been drawn below the influence of the magnetic field. This releases the magnet which then swings outward and away from the enclosing tube, thus tilting the mercury tube to the other position. In this position, the circuit to the tank switcher is open and, if the pipe line discharge valve is closed, the tank is available for production.

A standard 4-inch plug valve was modified to accommodate an explosion-proof condulet in which to house a switch mechanism to make or break an electrical circuit. As shown in Figure 6, the condulet was threaded into the bottom of the pipe line valve body casting. A mercury switch was attached to an adaptor connected to the valve plug.

Opening and closing the plug valve tilts the mercury switch to facilitate circuit changes. When the valve is open, the circuit through the mercury switch to the tank switcher motor is closed. Thus, tanks being run to the pipe line are automatically bypassed when the switcher searches for available tank room.

Mercury switches were utilized for the float switches and the pipe line valve switches to avoid the possibility of moisture entering the system, rendering it inoperative. Since mercury freezes at —40° F. and temperatures in Canada may be lower than this, it was deemed necessary to install heaters in all devices using these switches. All heaters are thermostatically controlled so as to avoid the possibility of overheating the insulated wiring during warm periods.

The heater circuit for the float switches and pipe line valve switches is wired separately from the control circuit. Heater circuits for the individual well control valves are also on separate circuits. In this manner, they may be serviced independently of the other system, or the circuits may be left open during the summer months.

Installation of controls on this lease is primarily for experimental and test purposes. Successful operation of this test will undoubtedly result in a saving of operating expense, and considerable benefit will be derived if they will enable operation of the lease in event of blizzards or impassable roads. These automatic controls, therefor, might well prevent loss of oil and consequent damages which would otherwise result. **—The End.**


ACKNOWLEDGMENT

Paper presented at April 13-15, annual meeting of The Canadian Institute of Mining and Metallurgy at Edmonton, Alberta, Canada, under the title "Automatic Operation of Flowing Wells and Tank Battery in Canada."

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# Lower Cretaceous in Alberta and Saskatchewan

**• Its importance to the small operator.**
**• Viking sand's shallower depths offer good return on farmouts.**

**By A. W. FARMILO,** Chief Geologist, Western Leaseholds Ltd., Calgary

A GOODLY PORTION of Western Canada, particularly Alberta, Saskatchewan and the Peace River-Fort St. John areas of British Columbia might fall into the category of a good Lower Cretaceous "play." The widespread nature of sands of this age represent a large potential reserve of oil and gas which undoubtedly will be profitably developed as markets become available and completion practices and techniques are improved.

These sands are attractive to the small operator because they lie within reasonable drilling depths over most of the area. An average drilling depth of 4500 feet will have penetrated the objective horizons in most areas. Often, these horizons can be drilled at much shallower depths. Typical drilling and completion costs are listed in Table 1.

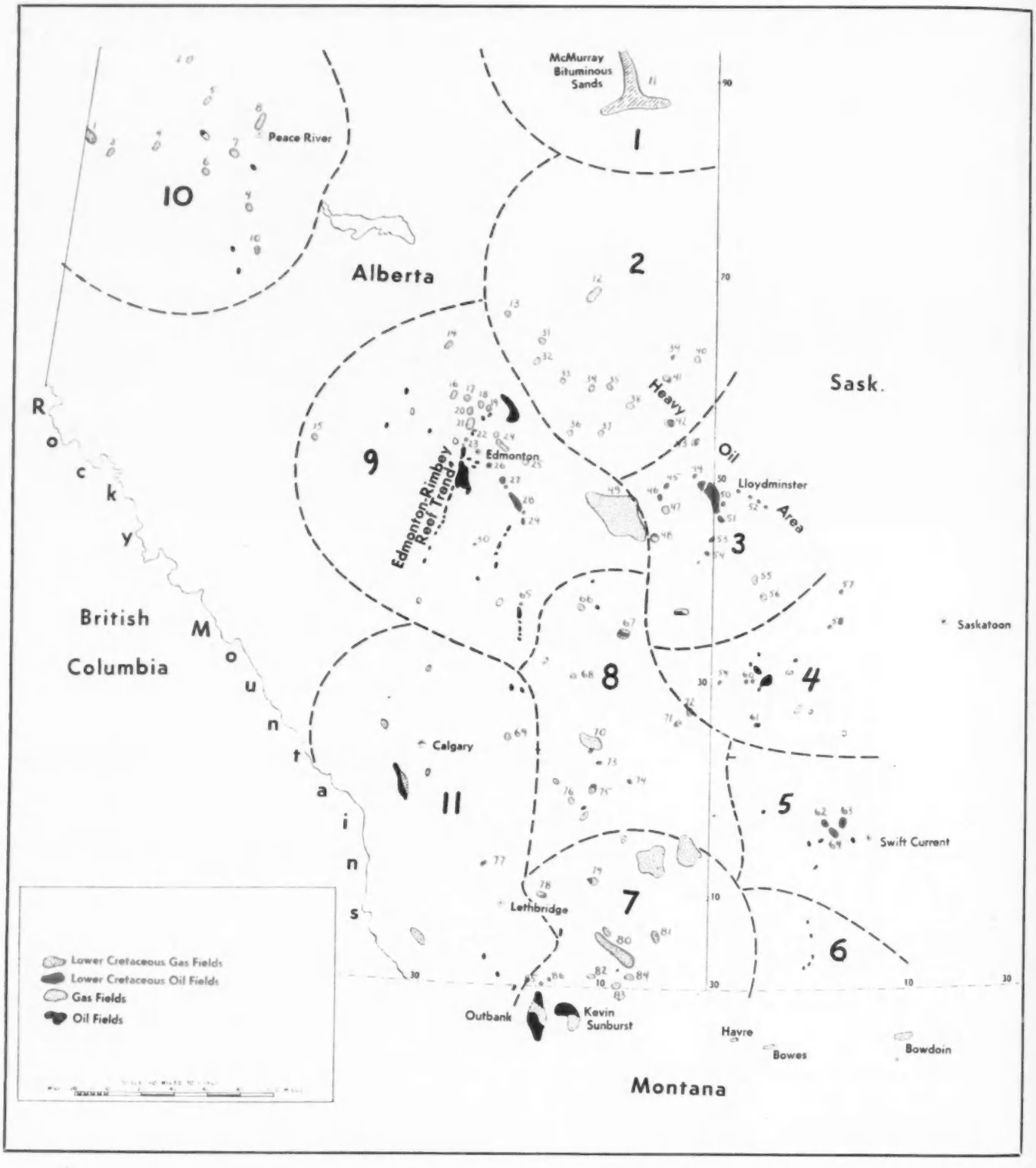
Up to the present the generally disappointing results from the pre-Cretaceous horizons in Saskatchewan and need for high cost-detailed exploration on "reef trends" in Alberta should encourage smaller operators to focus attention on the possibilities of exploiting the shallower accumulations. Major companies have directed their attention to the prolific and sometimes extensive Devonian reefs in order to discover and to build up substantial reserves, and they generally tend to be more concerned with the long term position rather than the short term payout.

The spectacular nature of these Devonian discoveries has tended to minimize the importance of the Lower Cretaceous accumulation of oil and gas. These considerations, coupled with the widespread activity of the major operators because of their numerous commitments, have tended to make farmouts available to smaller independent companies and individuals.

In view of this healthy situation,

## Type Stratigraphic Column—South Central Alberta and Saskatchewan

| Group | System | Series | South Central Alberta — Formation & Marker Zone | South Central Alberta — Typical Prod. Field | South Central Saskatchewan — Formation & Marker Zone | South Central Saskatchewan — Typical Prod. Field |
|---|---|---|---|---|---|---|
| CENOZOIC | QUATERNARY | RECENT<br>PLEISTOCENE | GLACIAL DRIFT | | GLACIAL DRIFT | |
| | TERTIARY | PLIOCENE<br>MIOCENE<br>OLIGOCENE<br>EOCENE<br>PALEOCENE | | | RAVENSCRAG | |
| MESOZOIC | CRETACEOUS | UPPER CRETACEOUS | BEARPAW | | BEARPAW | |
| | | | OLDMAN — FOREMOST | | BELLY RIVER | |
| | | | PAKOWKI — MILK RIVER | SUFFIELD | LEA PARK | |
| | | | FIRST WHITE SPECKS ZONE | | FIRST WHITE SPECKS ZONE | |
| | | | MEDICINE HAT | MEDICINE HAT FIELD | MEDICINE HAT | |
| | | | SECOND WHITE SPECKS ZONE | | SECOND WHITE SPECKS ZONE | |
| | | | FISH SCALE SAND ZONE | | FISH SCALE SAND ZONE | |
| | | LOWER CRETACEOUS | VIKING | JOSEPH LK., ARMENA | VIKING | BROCK |
| | | | JOLI FOU SHALE | | JOLI FOU — SPINNEY HILL SANDS | |
| | | | BASAL JOLI FOU SAND — "Cessford Sand" | CESSFORD | | |
| | | | MANNVILLE OR BLAIRMORE — Colony Equiv. | CHAUVIN | | |
| | | | Sparky Equiv. | | | |
| | | | Glauconite | | MANNVILLE OR BLAIRMORE | |
| | | | Ostracod Zone | | | |
| | | | McMurray "Basal Sand" "Ellerslie" | EDMONTON AREA CAMPBELL NAMAO, ETC. | Roseray Cantuar Wapella Sands | CANTUAR SUCCESS<br>WAPELLA |
| | | | Detrital | | Detrital | |
| | JURASSIC | | | CONRAD | SWIFT — J1A / J1B / J1C | FOSTERTON |
| | | | RIERDON | | RIERDON — J2A | Small Area WAPELLA |
| | | | | | Canyon Sprs. — J2B | JAVA, EASTEND, ETC. |
| | | | SAWTOOTH | | SAWTOOTH — PIPER — J3 | |
| | | | | | GYPSUM SPRINGS — J4A / J4B | |
| | TRIASSIC | | | | SPEARFISH ? | |
| | PERMIAN | | | | | |
| PALEOZOIC | CARBONIFEROUS | PENNSYLVANIAN | | JUMPINGPOUND TURNER VALLEY ETC. | BIG SNOWY GROUP | |
| | | MISSISSIPPIAN | RUNDLE | | MADISON GROUP — Charles | |
| | | | BANFF | | Banff — Mission Can. | |
| | | | | | Lodge Pole | COLEVILLE |
| | | | EXSHAW | | EXSHAW | |
| | DEVONIAN | UPPER DEV. | WABAMUM FM. | | WABAMUM FM. | |
| | | | WINTER-BURN FM. — GRAMINIA (?) | | WINTER-BURN FM. — GRAMINIA (?) | |
| | | | CALMAR | | CALMAR | |
| | | | NISKU (D 2) | STETTLER | NISKU (D 2) | |
| | | | WOOD-BEND FM. — Ireton — Leduc (D 3) | D3. BIG VALLEY STETTLER | WOOD-BEND FM. — Ireton — Leduc (D 3) | |
| | | | DUVERNAY ? | | DUVERNAY ? | |
| | | | COOKING LAKE | | COOKING LAKE | |
| | | | BEAVERHILL LAKE FM. | | BEAVERHILL LAKE FM. | |
| | | MIDDLE DEV. | ELK POINT ? | | FIRST RED BEDS<br>DAWSON BAY<br>SECOND RED BEDS<br>BIGGER SALT<br>WINNIPEGOSAN<br>ASHERN | |
| | SILURIAN | | | | STONE WALL | |
| | ORDOVICIAN | | ? | | STONEY MOUNTAIN<br>RED RIVER<br>WINNIPEG | |
| | CAMBRIAN | | UNDIVIDED | | UNDIVIDED | |
| | PRE-CAMBRIAN | | | | | |




what can the small operator expect when he obtains these farmouts?

**Future of Lower Cretaceous.** In 1950 and 1951 these sands were producing approximately 5.5 percent of the total oil. By the end of 1952 the Lower Cretaceous* sands were producing approximately 7 percent of Alberta's oil (see Table 2). (For purposes of this review the upper boundary of the Lower Cretaceous is considered to be at the base of the Fish Scale Zone which, in Alberta and Saskatchewan, defines the base of the Cenomanian and the top of the Albian. This definition of boundary was first presented by Dr. C. R. Stelck[1] and is now becoming generally accepted. By definition then, the Viking sand production is considered to be Lower Cretaceous in age. In any case, the very productive oil and gas Viking horizon is penetrated before reaching other productive Lower Cretaceous sands.) By the end of 1953 the figure will be close to 10 percent of the total crude production.

Of the 45 major producing areas in Alberta (at the end of 1952) 23 of these areas are producing from the Lower Cretaceous. In some fields other horizons in these same areas are

also productive. Horizons such as the Nisku (D-2) and Leduc (D-3) of Devonian Age are the major producing zones in these fields. The Devonian is the main productive formation of Alberta, producing over 87 percent of Alberta's crude. In several of the two-to-four-zone fields no production is being taken at present from the Lower Cretaceous.

It is significant that in Alberta in 1952 Lower Cretaceous, including Viking, production was just about double the crude produced from the Mississippian formation, having surpassed production from this horizon for the first time in Alberta's oil history.

In Saskatchewan total crude production in 1952 was 1,696,504 barrels. Approximately 83 percent of this oil came from the Lower Cretaceous. Nearly one-half the total so far produced from the Wapella field near the eastern boundary of Saskatchewan is produced from Jurassic sands. A greater amount of Jurassic oil is being produced from the Fosterton field. The Coleville field of Saskatchewan has found production from the Banff sand of Mississippian age. This field is also productive of Viking gas.

Principal producing areas in Saskatchewan and their production for the past three years are listed in Table 3.

Much of the Lower Cretaceous in Alberta and Saskatchewan has proved to contain significant gas reserves. At present, some of the Lower Cretaceous gas is being consumed locally within the Prairie Provinces. A small amount is exported into Montana from the Pakowki Lake area of Alberta.

A study of the natural gas reserve picture of Alberta by DeGolyer and MacNaughton revealed that 56 percent of Alberta's gas reserves is contained in sediments of Cretaceous age, nearly all of which is Lower Cretaceous gas. They point out, however, that the relative importance of gas from the other horizons will increase as exploration progresses. Figure 1 shows the location of the main fields producing gas and/or oil from lower Cretaceous in Alberta and Saskatchewan is included.

**General Geology.** With present knowledge of the Lower Cretaceous of Alberta and Saskatchewan, almost 40 units of formational rank are required to define the complex and variable lithology of this system. It is beyond the scope of this article to go into all the details of these correlations. Valuable contributions to the problems of correlation have been made by members of the Geological Survey of Canada, particularly, F. H. McLearn, Wickenden, and others. Recent work by C. R. Stelck, J. B. Webb, P. Badgley, and The Canadian Stratigraphic Service, headed by L. E. Workman, have contributed much to the regional picture of the Lower Cretaceous.

In general, the Lower Cretaceous of Western Canada consists of series of interbedded shales, sandstones, conglomerates, and coals. Parts of the Lower Cretaceous sequence are marine sediments. Between these marine transgressions there were periods of slight emergence in the course of which brackish and fresh water sediments were deposited. The accompanying chart shows the position of the productive Lower Cretaceous formations in relationship to the remainder of the stratigraphic column.

The Lower Cretaceous lies unconformably on Jurassic and Paleozoic strata. Pre-Cretaceous topography in the central and northern parts of the area had reached the stage of late maturity or old age. In the southern part of Alberta, evidence suggests that pre-Mannville topography was not quite as highly eroded. In the north-

**NEWLY-COMPLETED PUMPING WELL** in the Joseph Lake area, southeast of Edmonton, Alberta. Viking sand here averages 15 feet in thickness and produces 38-gravity crude.

**TABLE 1**
**Typical Lower Cretaceous Drilling and Completion Costs**

| | Acheson L.C. (Basal) | Armisie L.C. (Basal) | Bonnyville L.C. (Colony) | Joseph Lake Vik. Ss. | Lloydminster L.C. (Colony) | Stettler L.C. (Basal) |
|---|---|---|---|---|---|---|
| Depth (Feet) | 3500 | 4100 | 1250 | 3300 | 2000 | 4400 |
| 1. Preparatory exp., drlg., lic., surface well-site, etc. | $ 2500 | $ 2200 | $ 1800 | $ 2500 | $ 1500 | $ 2200 |
| 2. Footage costs | 17,500 | 19,500 | 4,000 | 14,400 | 6,000 | 23,000 |
| 3. Casing (surf. & prod.) scratchers, centralizers, tubing | 13,500 | 16,500 | 4,900 | 10,600 | 7,000 | 16,500 |
| 4. Day work | 5,500 | 9,000 | 1,500 | 5,500 | 2,000 | 6,000 |
| 5. Cement & cementing charges | 2,000 | 2,000 | 1,600 | 1,500 | 1,500 | 2,000 |
| 6. Coring bits, core analysis, barrel, trans., etc. | 2,500 | 2,000 | 200 | 400 | 300 | 2,000 |
| 7. Mud costs | 1,500 | 800 | 100 | 100 | 200 | 2,000 |
| 8. Services perf., acid, log, trans., wating time | 3,500 | 500 | 200 | 2,700 | 1,100 | 5,000 |
| 9. Drillstem tests, mileage & waiting time | 2,000 | 1,200 | 500 | 700 | 300 | 1,200 |
| 10. Engineering & geological supervision | 1,500 | 1,300 | 800 | 800 | 800 | 1,500 |
| 11. Producing well equipment | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 |
| 12. Sundry—hauling, welding, etc. | 2,000 | 2,500 | 500 | 1,200 | 800 | 1,100 |
| TOTAL | $55,000 | $59,800 | $17,600 | $41,900 | $23,000 | $64,000 |

ern part of the area, some rejuvenation of streams and river channels probably occurred during late Jurassic time and prior to Mannville time.

In pre-Cretaceous time (pre-Mannville time) this portion of the Prairies was, in general, part of a stable shield. The relationship of this topography and geology to the accumulation of Basal Cretaceous oil was presented in a paper by E. W. Beltz to the Alberta Society of Petroleum Geologists, published in summary in the local Society's *News Bulletin* paper of May 1953.

Some conception of the ancient topography and paleo-geology of the pre-Cretaceous appears to be of value in working out the problems involved in oil accumulation in the sediments of Mannville time. Similar studies must be carried out for the section between post-Mannville and pre-Fish Scale times (Basal Upper Cretaceous) before complete understanding of the Viking sand deposition and accumulation can be reached.

Most of the Lower Cretaceous sand accumulations are found in stratigraphic type reservoirs; structure appears to play the minor role. The sands, though well developed with good porosity and permeability in parts of the fields, often become shaly or silty, sometimes very abruptly. This shaling reduces the effective thickness of the sands and may result in several thin sands, sometimes each with its own water table.

**Viking Zone.** In drilling for Lower Cretaceous production anywhere in Alberta or Saskatchewan the first horizon of regional interest is the Viking sand. This sand is a fine to coarse quartz sand with black chert grains often containing Glauconite.

## About the Author

A. W. FARMILO was graduated from University of Alberta in 1941 with a B.S. in geology, then went to University of Oklahoma where he earned, in 1943, his M.S. in geology. He then worked for eight years for The California Standard Company in Western Canada and Richmond Exploration Company (Standard of California subsidiary) in Western Venezuela. He also worked for a short period in Bakersfield, Calif. He has worked as field geologist, well-site geologist, geological observer, and administrator of geophysics. He joined Western Leaseholds Ltd. in 1951 as assistant chief geologist. In July 1953, he was appointed chief geologist. He is a member of AAPG, SEG, Alberta Society of Petroleum Geologists; and is a registered professional Engineer of Alberta.

The Viking sand in places becomes shaly or silty, and this variation is evidently responsible for many oil and gas accumulations. On the extended Joseph Lake Armena-Camrose oil fields the eastern limits of production are defined by this facies change. This is true also in the large Viking-Kinsella gas field and gas fields of the Fort Saskatchewan area (See Area 9 on map).

Frequently, the top of the Viking zone is marked by a thin bed of chert and the main sands begin 15 to 30 feet below this zone marker. This interval allows the geologist time to accurately set his coring point. A common practice is to diamond core the sands and, in most cases, the recovery is greater than with the wireline.

Drilling depths to the Viking vary considerably over such a large area as Saskatchewan and Alberta. In general, depths will range from approximately 1200 feet on the east and northern parts of areas (areas 2, 3 and 4 on map) to greater than 5000 feet, west of the 5th Meridian in Alberta (west of the Edmonton-Calgary line). Gravity of crude from these sands will commonly be in the 32 to 38 range. It is not often that the effective oil pay section will exceed 15 feet; however, some Viking gas sands will reach 30 feet of effective pay. Porosity in these sands will average between 15 to 25 percent.

In Alberta and Saskatchewan Viking sand and its approximate equivalents, such as the Cadotte of the Peace River country (see Area 10 on map), is considered one of the most important gas zones in Western Canada. It is felt that the oil possibilities in this horizon are well established. The recent discovery of Viking oil, down-dip from the Driver Gas field (see Area 4 on map) in Saskatchewan should serve to encourage the small operator to make a play for this relatively shallow horizon.

Few drilling and completion problems are encountered in the drilling of Viking wells. The prolific Joseph

**Table 2**
**Total Production of Crude in Various Producing Horizons of Main Alberta Fields**

| MAIN PRODUCING HORIZONS | 1950 | | 1951 | | 1952 | |
|---|---|---|---|---|---|---|
| | Barrels Oil Produced | No. Fields | Barrels Oil Produced | No. Fields | Barrels Oil Produced | No. Fields |
| Leduc (D3) Dev. | 18,740,739 | 6 | 33,701,850 | 11 | 41,317,615 | 15 |
| Nisku (D2) Dev. | 3,422,741 | 6 | 6,535,248 | 12 | 10,078,473 | 16 |
| Lower Cret. | 1,463,325 | 14 | 2,419,300 | 21 | 4,278,903 | 23 |
| Mad. (Miss.) | 3,359,041 | 5 | 3,054,922 | 6 | 2,768,083 | 5 |
| Jur. | 110,062 | 1 | 142,497 | 1 | 135,037 | |
| Cooking Lake (Dev.) | ..... | .. | ..... | .. | 7,026 | 1 |
| Total | 27,095,908 | 32 | 45,853,817 | 51 | 58,585,137 | 61 |

**Table 3**
**Saskatchewan 1952 Production From Lower Cretaceous**

| FIELD | BARRELS OIL | | |
|---|---|---|---|
| | 1950 | 1951 | 1952 |
| 1. Lloydminster | 510,936 | 513,282 | 779,379 |
| 2. Lone Rock | 496,750 | 662,127 | 547,067 |
| 3. Dina Marsden | 27,315 | 50,914 | 47,233 |
| 4. Maidstone | 5,918 | 6,652 | 12,486 |
| 5. Wapella | ..... | ..... | 4,804 |
| 6. Hoosier | ..... | ..... | 4,440 |
| 7. Driver Eureka | ..... | ..... | 3,108 |
| 8. Buffalo Coulee | ..... | ..... | 1,825 |
| 9. Eastend | ..... | ..... | 1,408 |
| 10. Eatonia | ..... | ..... | 373 |
| | 1,041,097 | 1,232,975 | 1,402,161 |

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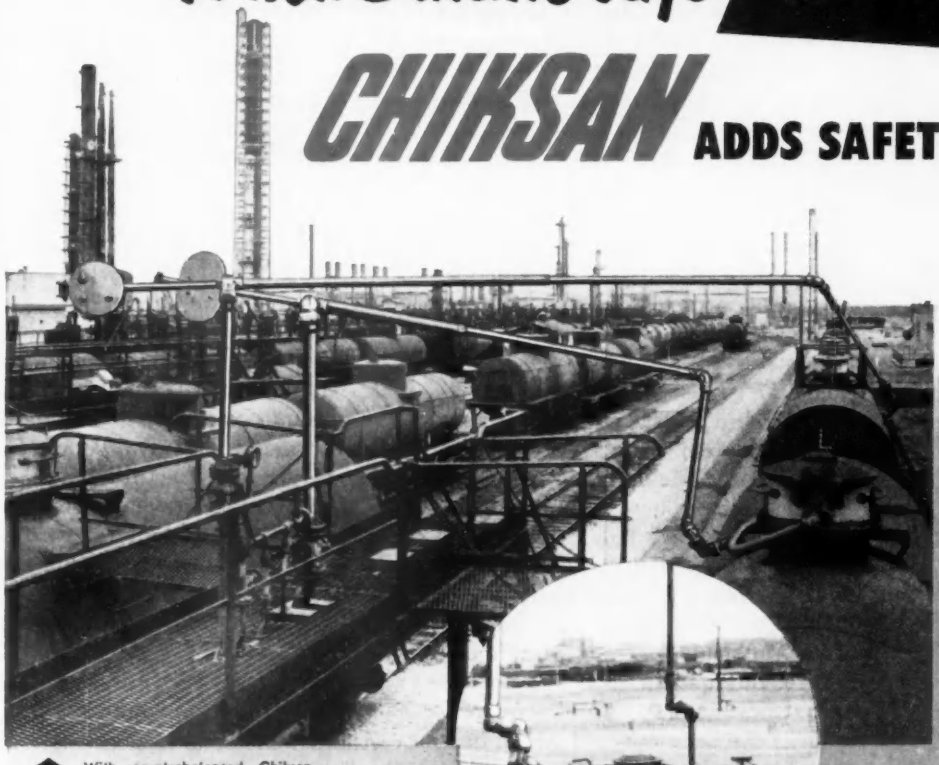

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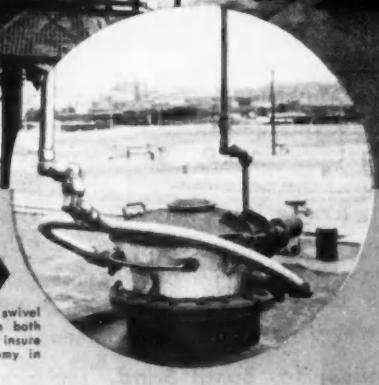

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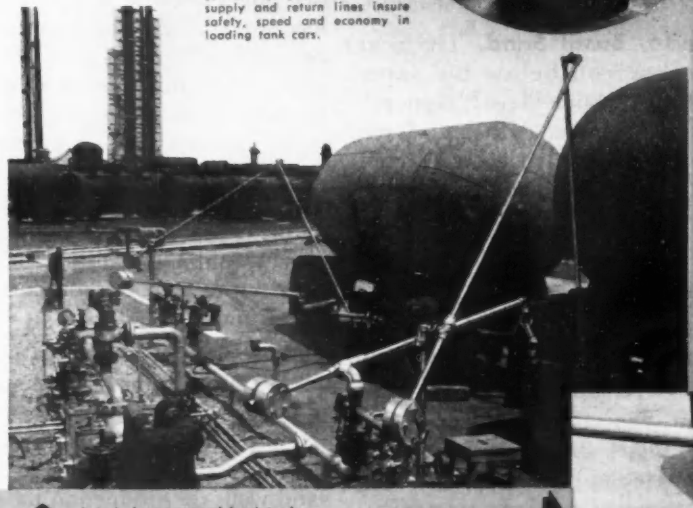
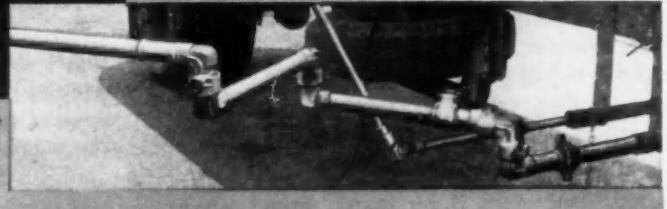


A typical near ground level truck loading rack using CHIKSAN joints on supply and return lines.



Close up of CHIKSAN low pressure joints on supply and return lines in truck loading of Butane.

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Lake-Armena-Camrose-Viking trend is rapidly becoming one of the top producing fields. Little trouble is experienced in completing Viking sand wells where the thickness of the sand is five feet or greater. Selected perforating can be carried out if a radioactive log is run to locate collars in relationship to porous sands. After correlating with electric log, micrologs, cores, and tests, the perforating intervals can be chosen with a minimum of error.

In some completions where only Viking gas is encountered in a 3 to 5-foot sand as in the Duvernay area east of Edmonton (see Area 3 on map), use of the radio-active log to locate the sands in relationship to collars is extremely important. The perforating has to be accurate.

**Mannville (Blairmore).** Below the Viking, the next possible productive horizon in the Lower Cretaceous is a Basal Joli Fou sand sometimes found two or three feet above the top of the Mannville, or Blairmore. This sand is productive in the Cessford area (see Area 8 on map) approximately 110 miles due east of Calgary. The sandstone is light grey, fine grained and composed of clear quartz grains, some chert, glauconite and other minerals.

In general, porosity averages about 24 percent and the pay averages 15 feet in thickness. A gas cap is located on the southeast of a northwestward dipping terrace, however, this reservoir appears to be a stratigraphic trap. An active water drive is present. Gravity of the oil is 25.9. Sulphur and asphalt content of the oil is high.

Production in Alberta and Saskatchewan from this sand appears to be limited. At present the Princess-Cessford areas are the only producing regions. Perhaps more detailed studies with reference to the Mannville or Blairmore top may place sands that are now called upper Blairmore in the Basal Joli Fou.

In the eastern part of Alberta and the western area of Saskatchewan around Lloydminster, Chauvin and Unity (see Area 3 on map), upper Mannville sands are productive of 9 to 18 gravity crude. This "heavy oil" area produces from sands known locally as the Colony, Sparky and General Pete, in descending order. Lithologic changes play an important role in limiting the producing area. Shaling out of the sands can take place rapidly.

The areal extent, however, of the "heavy oil" country can be large. For example the Lloydminster area itself covers an area 45 miles long and 25 miles wide. Within this region are six general fields. Drilling is on ten-acre spacing which is compared to 40-acre spacing required in nearly all other fields. Most of the wells are pumpers. Within recent years due to the increase in market and prices, production of crude from these wells has increased and exploration expanded.

A number of smaller companies have been attracted by the low cost of development and relatively high percentage of successes. Production from the wells varies from ten to 100 barrels a day. Minimum recovery is on the order of 2000 barrels per acre, and the maximum in excess of 4000 barrels per acre of proved land. In general sand thickness averages about 12 feet. Production rates have to be restricted in some areas due to the viscous nature of the oil, and water problems increase with higher rates of production.

In these areas completion techniques have been adopted which have considerably improved the results. Generally, casing is set through the reservoir and the hole loaded with oil. This is followed by perforating and placing the well on pump.

**Glauconite, Basal Sand.** The next objective horizon below the upper sands of the Mannville (Blairmore) would be the Glauconite and Basal sand. The Basal Quartz sand is called the McMurray formation or Bluesky formation in the Peace River area. Around Edmonton this sand is referred to as the Ellerslie formation. In Saskatchewan its equivalent is called by local names such as the Cantaur, Roseray and Fosterton sand. This formation has large crude reserves.

In many areas of Saskatchewan and Alberta, these Basal sands of the Lower Cretaceous have presented many geological and engineering problems. It is considered that Basal sands are more variable and result in more disappointments than do the Viking or some of the other Lower Cretaceous sands. Certainly, the greatest care is needed in development and completion of wells from these sands.

Large gas reserves have been established in the Basal Quartz sandstones. In fact, the outstanding feature of many Basal sand oil fields is the presence of a thick active gas cap in relationship to a thin oil column of 10 to 15 feet or less. The sands usually have good porosity and permeability.

It is within this Basal 200 feet of the Lower Cretaceous that the greatest compensation and adjustment of the sediments to the underlying Paleozoic topography occurred. It was largely completed by Ostracod time. Much evidence exists to show that many of these sands and alternating shales and sands were deposited close to shorelines and along wide river estuaries and channels.

With these conditions present many dry holes are drilled in delimiting fields in the basal Cretaceous sands. The accumulation of hydrocarbons in this formation is already established as being very large. The Athabasca Tar Sands (see Area 1 on map) of Lower Cretaceous Age are the largest known oil reserves in the world. Estimates of the tar sands crude reserves range from 100 billion barrels to 200 billion barrels. A portion of these sands is now under lease by several large companies and small company groups.

Another factor in considering Basal Cretaceous sand possibilities, in fact all Lower Cretaceous accumulations, is the theory that the oil and gas has been derived from unconformably underlying Paleozoic strata. This theory has protagonists who maintain that a proper understanding of this theory will contribute immeasurably to the locating of additional Lower Cretaceous reserves. The occurrence of the heavy black oil and the tar sands in areas northeast and east of Edmonton in the Athabasca, Vermillion, Wainwright, and Lloydminster fields could suggest the Paleozoic origin of Lower Cretaceous oil and gas.

Whatever the origin of the oil and gas within the Basal Quartz sands and the Lower Cretaceous sands above, the problems of delineating the productive area and placing these Basal sand wells on production have proved to be problems of immediate concern.

The only apparent hope of satisfactory completion of the thin oil pay sections generally up to 12 to 15 feet overlain by thick gas caps sometimes in excess of 50 feet appears to be in the improvement of engineering procedures.

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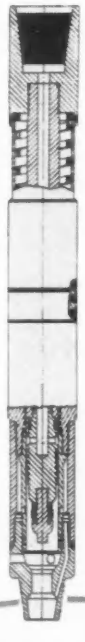

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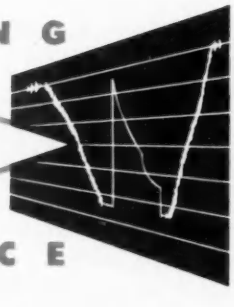

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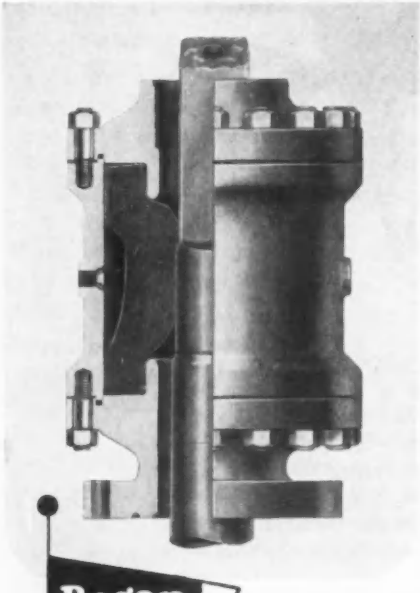

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be exercised from the first penetration of the Bascal Quartz sand. From the present trend of thinking, it appears that maximum results are obtained from diamond coring. The correct geological information obtained from the cores is required to make accurate correlations with the electric log, microlog and radioactive logs. Cores should be canned immediately and a complete core analysis made. Cores should be cut in short enough intervals for establishing gas-oil and oil-water interfaces.

In this respect every stepout well should be considered a wildcat and the same procedure followed. It is likely that tilted fluid interfaces will be established. Correct calculations made from these data should assist in locating succeeding wells. Adequate control over pipe measurements, electrolog, microlog and radioactive measurements should be maintained, to insure that the basic information needed for completion is accurate.

Water and mud blocking from poor mud control causes trouble in some of the Basal sands. This can be remedied by the use of a low water loss mud, and a proper mud mix prior to sand entry.

Poor cement jobs sometimes have resulted from the cost-cutting practice of some operators of not using centralizers and scratchers. Cementing can be better accomplished by holding back pressure on the annular space which appears to prevent gas from "fluffing" the cement. Some of the thin Basal oil sands have been cemented off in part or entirely by the use of excess cement. Stage cementing appears to be successful in some cases. The use of sand frac in some Basal Quartz fields has improved the production: horizontal permeabilities have been increased and production rates can be kept in line with reasonable pressure drawdown.

Considerable experimentation by several companies has and is being carried out to improve production capabilities of these Basal sand wells. Undoubtedly in the future techniques will be improved to the point where some marginal fields will become commercial. In Saskatchewan, Basal sand fields do not appear to be facing the severe problems encountered in Alberta. In some fields, however, production history is not long enough to give an overall picture.

A large area of Western Canada is underlain by possible productive Lower Cretaceous sands. Some of these sands, in the Viking in particular, have been proved to contain large accumulations. These sands lie at reasonably shallow depths over such wide regions in Saskatchewan and Alberta.

In Saskatchewan the generally disappointing results from drilling of the deeper horizons has tended to focus attention on the productive Lower Cretaceous sands, together with those in the Jurassic. In Alberta the greater cost, deeper drilling and limited possibilities of "building up" a land play for the Devonian "reefs" leaves the door open for the smaller operator to pay some attention to the less spectacular Lower Cretaceous sands.

From the results to date, the Viking sand appears to offer the small operator the greatest return for money spent. Farmouts are apparently still available and should they be taken, the farmee should bear in mind the probabilities and possibilities of the underlying Mannville or Blairmore sands.

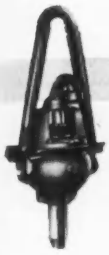
Production will have to be restricted from these lower sands because of the associated gas and water problems. In some of these sands, however, the gas reserves will undoubtedly prove to be the main source of revenue. In others, crude may only be recovered when the gas can be produced.—**The End**

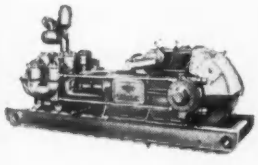
REFERENCE

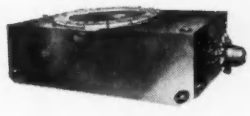
[1] Paper delivered to ASPG, May 19, 1952, by Dr. C. R. Stelk, University of Edmonton, Alberta.

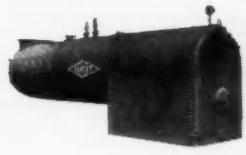
**For other Canadian articles in this issue turn to . . .**

- **Exploration Section** *Page 91*
- **Drilling Section** *Page 117*
- **Production Section** *Page 171*









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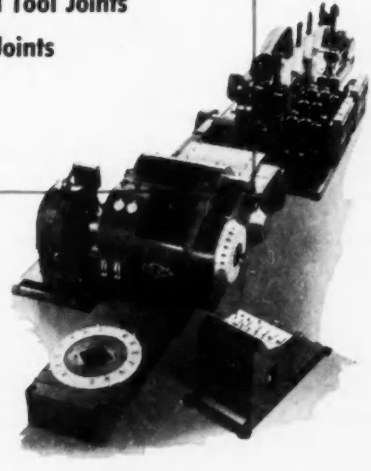

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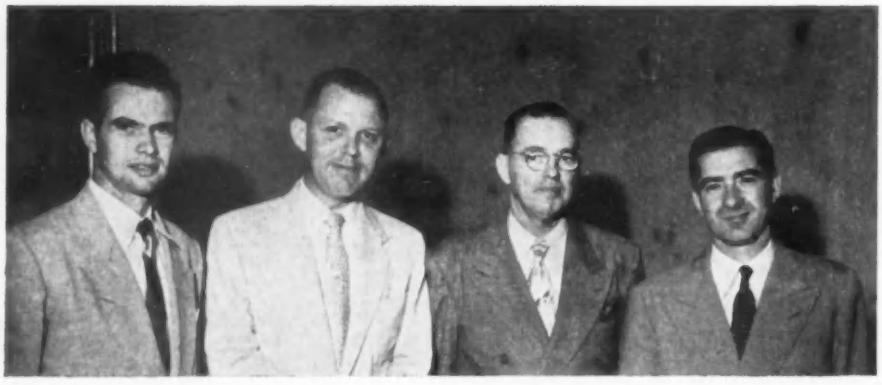
# What's Happening

## AMONG WORLD OIL MEN



**HOUSTON GUESTS.** International guests at the October meeting of the Houston chapter of Nomads included, left to right: Hank Besijn, Shell Oil Company of Venezuela, Maracaibo, Venezuela; Fred Haesecker, Asiatic Petroleum Corporation, Houston; Guy Woodruff, Mene Grande Oil Company, Barcelona, Venezuela, and N. C. Bouco, Y.P.F. of Argentina, Buenos Aires.

GEORGE L. NOBLE, JR., has been named president of Stanwell Oil and Gas Limited, Canadian independent oil company. Noble has had extensive experience in all phases of the oil business and has also held government posts. Since May, 1951, he has headed the Small Business Office of United States Army Ordnance.

From 1942 to 1946 he served as regional director of the War Production Board for Oklahoma, Louisiana and Texas. Prior to this assignment he was district manager at Houston of the Office of Production Management.

Noble was vice president and general manager of Western Gulf Products Company from 1939 to 1941. Before that he was vice president and general manager of the Greta Oil Co. He is a director of Texas Industries, Inc.

After attending the University of Texas, he received his engineering degree at Cornell University.

•

GEORGE L. CUMMING, former assistant chief of explorations for Petroleos Mexicanos, government oil monopoly, has moved up to head his department, following the resignation of veteran geologist MANUEL RODRIGUEZ AGUILAR.

Aguilar, who quit to form his own private consultation service, has left Mexico for a visit to Bolivia.

At the same time, it was announced by Bolivia's ambassador to Mexico, the Bolivian government will take advantage of the presence of the expert in that country to undertake an investigation of the possibilities for petroleum exploration and exploitation in Bolivia.

•

ROBERT SIEGEL, who has been named a director of Socony-Vacuum Oil Company, Inc., in charge of Middle East affairs, rose up through the ranks from an office boy. Taking his entire college course in night school at New York University, Siegel became assistant to the director in charge of production in 1926.

Shortly after receiving his bachelor of science degree in 1932, he was made secretary of the company's executive committee, and four years later was appointed assistant manager in charge of foreign production. In 1946 Siegel was transferred to Caracas and elected president of Socony-Vacuum Oil Company of Venezuela. Three years later he returned to New York and was named manager of the foreign producing department. He served in that position until two years ago when he was elected president of Socony-Vacuum Overseas Supply Company with headquarters at Fort Lee, N. J.

In his new position, Siegel fills the vacancy on the board of directors left by the death recently of CHARLES L. HARDING. Siegel has been succeeded as president of Socony-Vacuum Overseas by A. C. INGRAHAM.

•

J. W. CHURCHMAN, former assistant deputy minister of the Natural Resources Department, has been named to succeed Hogg. Churchman joined the department in 1946, and two years later was appointed assistant deputy minister. He recently organized the Conservation Officer Training School to train future field staff for department employment.

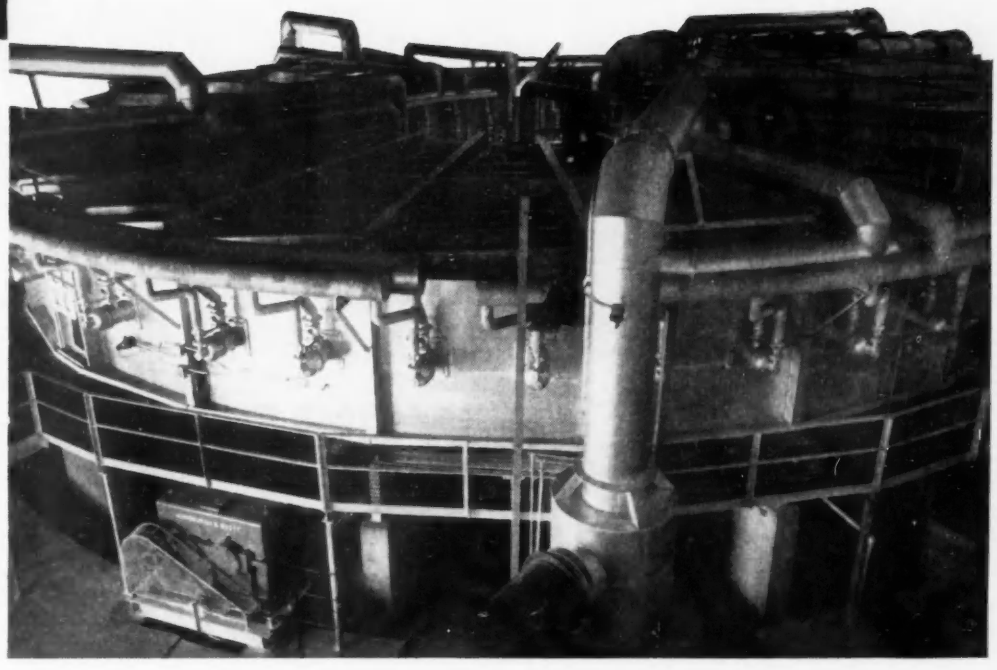
•

H. H. ARNOLD, JR., who recently assumed his new position of managing director of Caltex Pacific Petroleum Maatschappij at Djakarta, Indonesia, will continue as a vice president in the producing division of California Texas Oil Company, Ltd.

Arnold joined Caltex early this year after nearly 26 years with The Texas Company including time away for service in World War II during which service he received several decorations including the Legion of Merit, Silver Star and Croix-de-Guerre. His first service with Texaco was in Houston in 1927. His oil career prior to the war was in the southwest, principally in the Oklahoma division.

Returning to Texaco in 1946, Arnold became manager of the Rocky Mountain division in 1948. After experience in Canadian operations and a brief return to Houston, he was made manager of foreign operations in the Eastern Hemisphere with headquarters in New York.

# CF&I SEAMLESS TUBE MILL



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A giant 70-ft. rotary furnace, one of the largest ever constructed for American industry, has been installed in the new mill. Carefully controlled, uniform heating of steel billets is vital to the production of quality seamless oil country tubular goods. This new revolving-hearth furnace is designed to give a maximum degree of uniformity in the heating process. Billets processed in this furnace range in size from 3 to 8½ inches in diameter and from 4 feet 9 inches to 18 feet in length. The heated billets emerge from the exit ports and are fed directly to the piercing mills.

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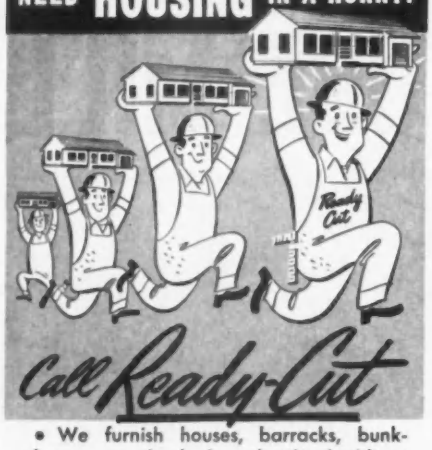


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GAS FOR STALINGRAD. The first natural gas line to serve Russia's industrial center of Stalingrad on the Volga River is nearing completion.

# a WORLD of OIL

By **DON KLIEWER,** WORLD OIL Staff

**Russia:** The Ministry of the Oil Industry slightly exceeded its assigned production quota during the first six months of 1953, achieving 100.5 percent of plan, according to reports . . . Compared with the first six months of 1952, crude output reportedly gained 11 percent, gasoline 9 percent, kerosine 24 percent, diesel fuel 13 percent and natural gas 6 percent . . . Manufacture of oil field equipment has risen 27 percent, it is claimed . . .Premier Malenkov says 1953 crude production will be 377,832,000 barrels . . . That yield was said to be tantamount to an increase of almost 70 percent above 1940 production.

**Israel:** Husky Oil Company's studies areas of its extensive permit area are encouraging . . . Negotiations are under way to keep one or two drilling rigs in use during 1954.

**Peru:** Peruvian Pacific Petroleum Company, wholly-owned subsidiary of Cities Service Company, has acquired about 300,000 acres of exploration and development lands in the Talara producing area on the northern coast. Acquisition is under a contract with Empresa Petrolera Fiscal.

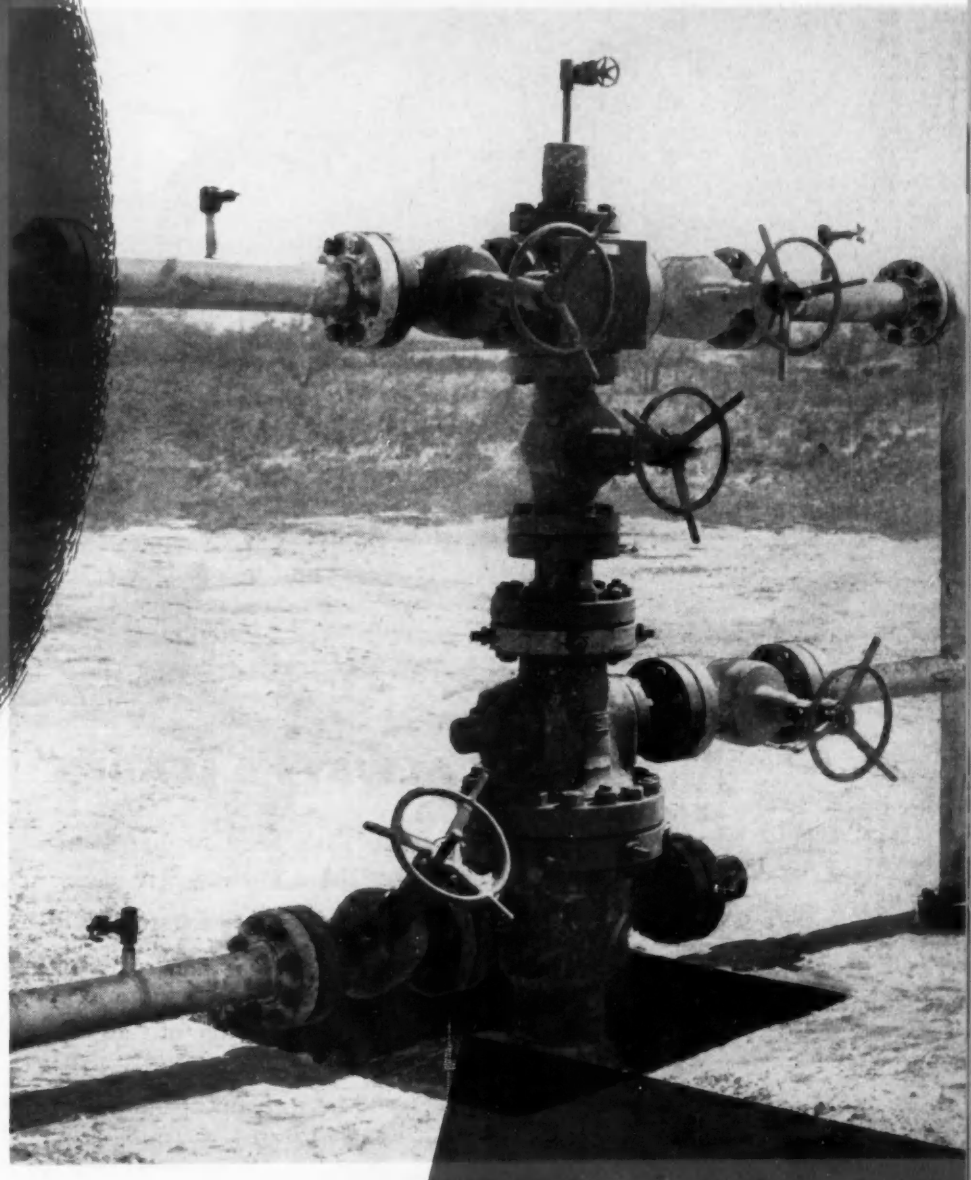
**Canada:** More than 2 million barrels ($6 million worth) of oil will be required to fill the Trans-Mountain pipe line in 1954. Thirty days will be required for a barrel of oil to travel the 718 miles from Edmonton, Alberta, to Burnaby, B. C.

**Germany:** Deutsche Vacuum Oel AG.'s Voigtoi 1, about 11 miles southwest of Nienburg (Weser), is flowing about 50 barrels of light crude daily from the Cornbrash formation. The well, reported completed earlier, will undergo tests from higher horizons . . . Rumors again are flying over the possibility of a trans-continental net of pipe lines, the main part of which is said to be the line connecting Duisburg with the hydrogenation works of Gelsenberg and Scholven . . . Rumors about the allegedly planned pipe line from Narbonne to Hamburg will be denied . . . However, soon to commence is a pipe line for military use which will transport gasoline and which will connect Bordeaux and Kaiserslautern via Paris. For this line, the U. S. will provide for building material and France will furnish landed property and manpower.

**India:** A $3 million contract to build a 50-mile crude pipe line system in Bombay has been awarded to Merritt-Chapman and Scott Corporation. Collins Construction Company will handle the marine work . . . An extensive system of pipe lines linking two refineries to be built in Bombay is sched-

# Everything's under control...

by O-C-T



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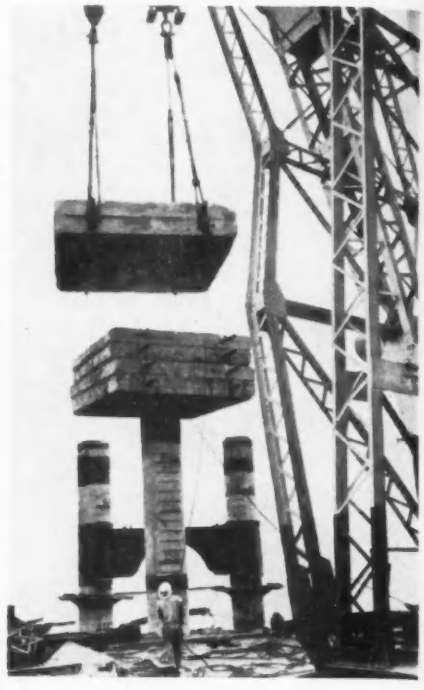

**OPERATION CAISSON.** Drilling in up to 100 feet of water in Venezuela's Lake Maracaibo makes necessary the sinking of giant caissons in the lake floor to support rigs. The cement and steel caissons shown here are 160 feet long.

uled, with an offshore marine terminal.

**Belgium:** A seismic reflexion crew of Seismos GmbH, Hanover, Germany, has been in operation in the Province of Campine.

**Netherlands:** A Nederlandse Aardolie Maatschappij wildcat, about nine miles northwest of Schoonebeek oil field near Aalden village, has struck an oil-bearing horizon at 2624 feet. It has not yet been determined whether the discovery will warrant commercial development . . . The NAM wildcat Rijswijk is producing from the Hauterive (Lower Cretaceous). Preparations are under way for two more tests near the Rijswijk site.

## Itterbeck Natural Gas Field Is in Production

Germany's Itterbeck natural gas field, situated in Emsland district near the Dutch border and a 1952 discovery, has been placed in production.

First, a total of 882,500 cubic feet of gas will be produced daily from Itterbeck 1 and 2, and transported to Georgsdorf and Scheerhorn oil fields through a 15.6-mile pipe line. There, the gas will be injected into the oil reservoirs to increase pressure.

Previously, Georgsdorf had got its injection gas from the Frenswegen gas

field, near Nordhorn. For the present, Frenswegen gas will again be routed to Nordhorn's textile industry.

## Glenn McCarthy, Inc., Sends Equipment to S. A.

The $700,000 worth of drilling equipment with which Glenn McCarthy, Inc., will begin drilling in Bolivia under terms of a recent agreement with the Bolivian government was scheduled to be shipped by boat from Houston in November. Under terms of the lease agreement between the Houston firm and the South American country, drilling operations must begin within three months after equipment arrives.

This equipment, assembled, tested and packed at Lee Construction Company, Houston, will be taken to Los Monos dome area, where the first three wells will be drilled. The initial year's operations will cost about $1.5 million.

The 35-year lease gives McCarthy exploration and development rights on 970,000 acres of wildcat land in the southeast province of Gran Chaco. Signifying Bolivia's willingness to accept foregn capital and technical assistance in developing prospective oil wealth, this lease will help provide for Bolivia a more balanced economy and, upon the discovery of commercial production, may help the Western Hemisphere become more self sufficient in petroleum.

Bolivia's current daily average production is approximately 1500 barrels, about half of domestic requirements. Under the McCarthy lease, Bolivia will have first claim to any gas or oil produced on the grant by the Houston firm. Any surplus up to 10,000 barrels a day will be sold at the wellhead and at regular market prices to Argentina, Peru, Brazil, Chile, Paraguay, or Bolivia.

## New Oil Structures in Egypt Are Believed Found

German geologists have suggested to the Egyptian government the drilling of four wells in the Ras Matarma zone, where it is claimed oil structures are to be found at 11,800 feet. These horizons are calculated to be of greater importance than those discovered in 1948 at a depth of 9186 feet.

Discovery of additional oil structures is claimed in Akhmin zone, west of Hurghada, by a private party of West German geologists.

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## Work Begins on Laying 2 Crude Pipe Lines at Aden

Work has begun on laying 16-inch and 6-inch pipe lines to join Anglo-Iranian Oil Company's 100,000-barrel-a-day refinery being built at Little Aden to tankage in the BP International Oil Bunkering Installation at Aden.

Upon completion of the pipe lines, more than 40,000 barrels of various grades of oils will be pumped to the installation, which is one of the world's largest bunkering stations. The two pipe lines will be laid alongside the road from the refinery to Aden, and will be buried underground, except at two points where they will cross bridges over tidal inlets.

Four grades of oil will be pumped through the pipe lines and go-devils separating them will be fitted with radioactive capsules which will warn the operator at the installation when to open and close appropriate valves.


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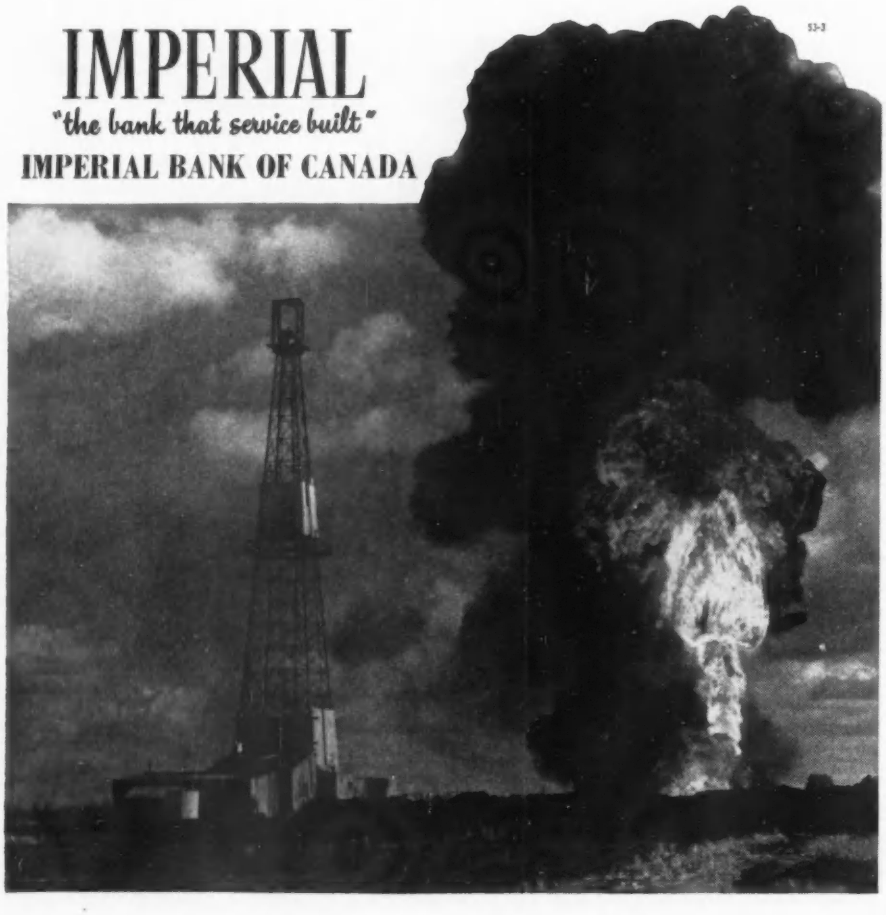


## Major Saskatchewan Oil Discovery Is Indicated

A major oil discovery in north central Saskatchewan is indicated with the announcement that Imperial Oil Limited has recovered 36.4 gravity oil in a series of drillstem tests at Imperial Smiley 7-15V-31-25, about two miles north of Smiley and 20 miles northwest of Kindersley.

Gravity of the crude is termed "considerably higher" than previously has been found in Saskatchewan.

A Saskatchewan government announcement said that oil recovery occurred in the Viking sandstone between 2302 and 2338 feet. The well was drilled to a total depth of 2386 feet.

A test of interval 2308 to 2315 feet gave a steady natural gas flow estimated at 100 MCF daily. After 60 minutes, recovery consisted of 300 feet of slightly gas-cut light oil.

A 60-minute test between 2314 and 2320 feet resulted in a gas flow estimated at 60 MCF daily and recovery of 210 feet of gas-cut light oil and five feet of mud.

Between 2320 and 2326 feet, the gas flow abated, and 60-minute recovery consisted of 390 feet of slightly gas-cut light oil. A test of 2326 to 2332 feet, again 60 minutes, yielded 10 feet of oil-cut mud.

In the final drillstem test, the valve was opened for 90 minutes. A natural gas flow was estimated at 100 MCF daily, and recovery consisted of 600 feet of light oil. No water was recovered in this test.

Production casing was set at 2388 feet, and perforated in the 2322-2330 foot level. The well was being placed on pump production.

## Ploen Field Boundaries Extended by 2 More Wells

Two more wells have discovered oil in the Ploen field, east of Holstein Province. Ploen 6, one of the new discoveries in the 1952 field, has extended the productive area by about 1000 feet south. It is producing about 250 barrels daily through a 5/32-inch choke.

To conserve reservoir pressure, production will later be reduced to 125-190 barrels a day.

Ploen 7, the second successful venture, extended the northern boundary of the field 1000 feet.

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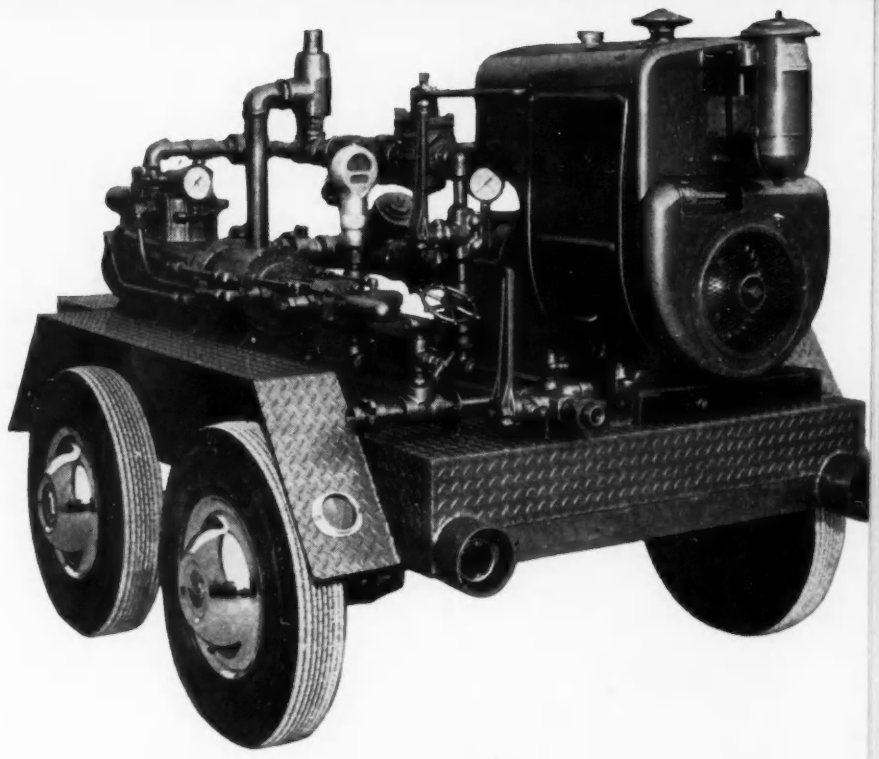

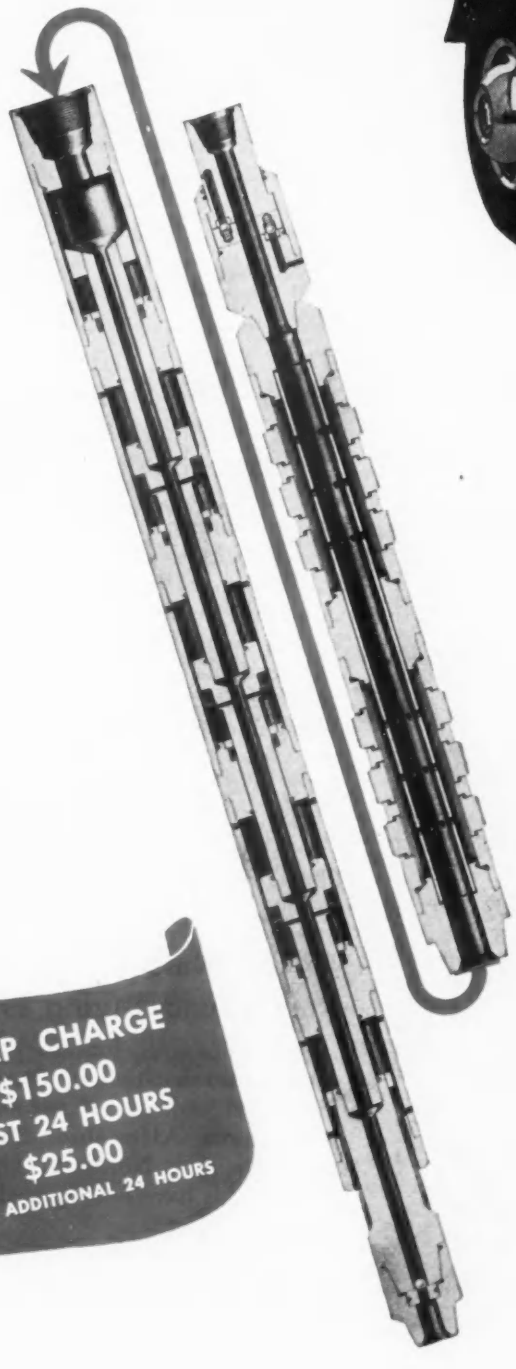

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## PREPA Drilling 2 More Wells in Alsace Field

Societe de Prospecion et Exploitations Petrolieres en Alsace is developing a French oil field at Staffelfelden, in Alsace. Currently, two wells are being drilled and four are producing.

Production is from fractured limestone in the Jurassic at 6000 feet, and two months are required to complete each well. Nine and five-eighths-inch surface casing is set to 600 feet, and 6⅝-inch production string is cemented above the producing formation. The gas/oil ratio is 10 to 1, and the 41-gravity crude is trucked to Pechelbronn, 100 miles to the north.

The largest producer yields 200 barrels daily, two others produce from 100 to 125 barrels a day and output from the fourth amounts to 30 barrels daily.

## Syria Well Is Shut in By Excessive Demands

North of Tripoli, Syria, Iraq Petroleum Company has discovered an oil-bearing horizon from which one well is producing five barrels daily. Reportedly, however, the well has been shut in because of excessive demands made by proprietors of the site.

Efforts have been under way to urge the Syrian government to establish a more favorable mining law to erase the danger of undue demands from local interests.

Also in the Levant, Western Pacific began drilling earlier this year at Sehmore, Lebanon, after extensive prospecting in the Southern Bekaa region.

## 4 New Natural Gas in Italy Found During 1953

Agip-Mineraria, subsidiary of Azienda Generale Italiana Petroli, has discovered four natural gas fields this year—Imola, Alfonsine, Cotignola, and Selva, all in Northern Italy. Wells in the fields have been placed in operation.

In Sicily, Agip-Mineraria has organized the Mineraria Sicilia Orientale, which has taken taken over research and development permits as well as operations of the Esvaiso of Commendatore Leonardi, who has discovered a gas structure in the Catania district. The Catania structure is likely to be connected with the Etna volcano.

# New Equipment

## SUPPLEMENTING COMPOSITE CATALOG

## Jet Eductor

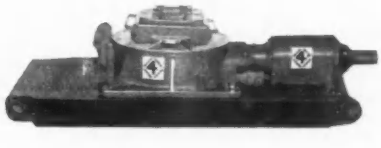
The George E. Failing Company of Enid, Okla. has announced a new model drilling rig which can be used either for conventional type rotary drilling or reverse circulation drilling. The new rig is called the Holemaster JED. The JED is designed to drill large diameter holes to 500 foot depths by the reverse circulation method with six-inch inside diameter drill pipe. Using the same pump unit (centrifugal type), it will drill 1,000 foot holes with 4½-inch convention drill pipe. The unit will handle a maximum casing load of 56,000 pounds and the retracting rotary table permits a clearance for 60-inch casing or bits.

An outstanding feature of the JED rig is the jet eductor, a hydraulic jet mechanism so designed that it develops a high vacuum, thus enabling operations to a greater depth. The Jet Eductor is instantly self-priming and the use of separate priming devices is eliminated. The streamlined six-inch full opening through the jet, which has no moving parts, is designed so that all the cuttings, grit and boulders in the return line completely bypass all mechanical devices. The centrifugal pump handles the small quantity of cutting-free water necessary to actuate the jet.

The slush pump is a Gorman-Rupp high pressure centrifugal type, V-belt driven and with four-inch discharge and five-inch suction. The pump powers the jet eductor for reverse circulation and also is suitable for drilling medium size holes to a depth of 1000 feet with large internal flush drill pipe by regular rotary method. The weight of the drill with operating equipment, less the drill pipe, is 24,000 pounds.

**This item supplements George E. Failing Company data on pages 1625-1648 of the Composite Catalog, 19th Edition.**

**Circle No. 1 on Postcard**



## Rotary Table

A newly designed rotary table is being offered the drilling industry by Big Four Machine & Supply Company. Built especially for slim hole drilling rigs and servicing units, the new product is a complete oil bath table designed to eliminate slopping over and leaking. It has a 14-inch opening to take a standard 13½-inch drive bushing and is furnished with or without skids.

**This item supplements Big Four Machine & Supply Company data on pages 707-710 of the Composite Catalog, 19th Edition.**

**Circle No. 2 on Postcard**

## Standing Valve Puller

A positive acting simplified tap type standing valve puller is announced by D & B Division, Emsco Manufacturing Company. It consists of only five parts: body, housing, spring, key pin and tap. Any of these parts may be changed in the field. As a result, the unit does not have to be discarded when only one or two parts are worn. The new standing valve puller fits all API cage, plunger, and cup body sizes and it is spring loaded to protect the tap. The tap has three-fourths-inch standard API "G-1" threads and is heat treated for greater strength and resistance to wear. The new puller is also equipped with a stainless steel spring to resist corrosion.

**This item supplements Emsco Manufacturing Company, D & B Division, data on page 1374 of Composite Catalog, 19th Edition.**

**Circle No. 3 on Postcard**

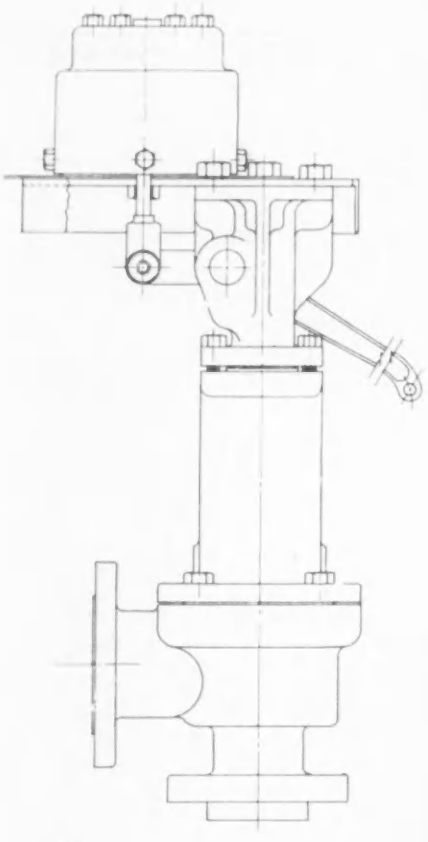
## Piston Ring Sets

The motor truck division of International Harvester Company is making available through its nationwide parts supply system chrome-plated 2-in-1 piston ring sets in the popular sizes for International green, silver, blue, black and red diamond engines. Each oil ring, packaged in IH boxes, is offered with both a normal pressure and high pressure expander to make available the choice of the one best suited to the engine's needs.

**This item supplements International Harvester Company data on pages 2633-2636 of the Composite Catalog, 19th Edition.**

**Circle No. 4 on Postcard**

***Save time! Keep informed! Circle numbers on postcard, page 301***



FARRIS REMOTOR DEPRESSURIZING SAFETY VALVE

## Safety Valve

The "Remotor," a new depressurizing safety valve, has been announced by the Farris Engineering Corporation. The "Remotor" is designed to rapidly depressurize pressure vessels in event of an emergency and also to function as an "unloader" for those applications where the unloading feature can be combined with a safety valve. In addition the depressurizing component of the "Remotor" is interchangeable and can be readily mounted on other Farris safety valves already installed. It will operate under all conditions, including fire, freezing and current failure and offers the user the economies of eliminating costly special valves and controls.

**This item supplements Farris Engineering Corporation data on page 1624 of the Composite Catalog, 19th Edition.**

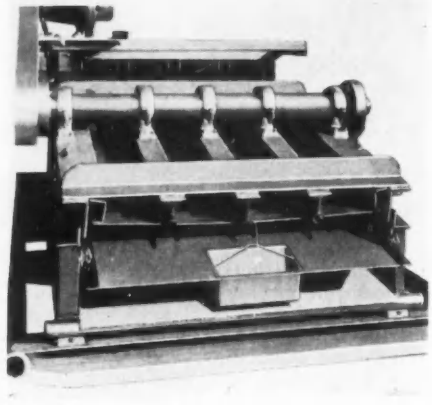
**Circle No. 5 on Postcard**

## Line Blind Valve

A new five-bolt, 18-inch line blind valve, designed to fulfill demands of industry for a line blind valve that will accommodate larger pipe lines has been placed on the market by Hamer Oil Tool Company. The new line blind has an A.S.A. rating of 150 pounds for working pressure up to 230 pounds. It provides either a full-diameter, smooth, round opening, or a permanent, leakproof shut-off. The neck of the spectacle plate on the valve is suspended on the top bolt so that it can be revolved in either direction when opening or blinding the line. The two side bolts on the valve swing out thereby making it unnecessary to remove any bolts when reversing the spectacle plate. Easily operated by one man, the five bolts on the 18-inch model are quickly spread and tightened even in close-coupled, compact manifolds. The bar operated bolts eliminate wedges, hammers and wrenches needed for spreading conventional flanges and remove the fire hazard of sparking. The five bolts are large enough in diameter to meet pressure requirements of corresponding flanges having many more bolts.

**This item supplements Hamer Oil Tool Company data on pages 2305-2336 of Composite Catalog, 19th Edition.**

**Circle No. 6 on Postcard**

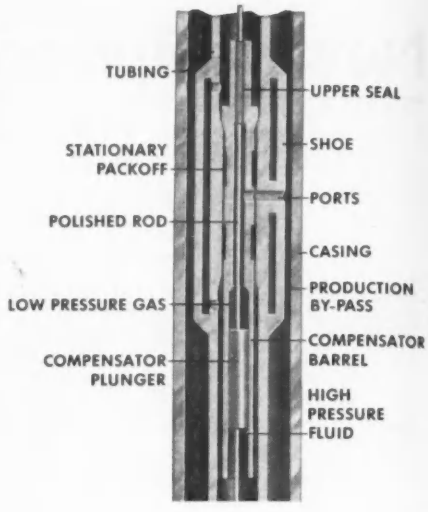


## Shale Shaker

Hutchison Manufacturing Company has announced the development of a new model "Rumba" shale shaker with de-sander pan and removable sample catcher. With this completely new de-sander pan, even flour sand particles can be removed from the drilling mud, thereby restoring the desirable clean, non-abrasive properties to the drilling mud. Sand is removed through the "Rumba" shaker's exclusive flotation process. With this process, adhesion holds droplets to the bottom of the screen cloth. As the fine sand sifts through the cloth, it is caught in the droplet and held until the weight causes it to drop off into the de-sander pan. Water jets keep the sand moving in the de-sander pan. A removable sample catcher is built into the "Rumba" shaker enabling the geologist to obtain samples for analysis at intervals as desired. "Rumba" shale shakers are long lasting and economical to operate, giving months of service under hard field conditions.

**This item supplements Hutchison Manufacturing Company data on pages 2455-2460 of the Composite Catalog, 19th Edition.**

**Circle No. 7 on Postcard**




## Weight Compensator

A new tool that hydraulically balances the lower half of tool string has been placed on the market by Fluid Packed Pump Company. Known as the Oilmaster rod weight compensator, this tool is a hydraulic counter-balance located below the midpoint of the rod string. It solves the problem of high sucker rod stresses in deep wells by balancing out part of the sucker rod weight at a point midway in the rod string. By counterbalancing the weight of the lower part of the rod string, the compensator substantially reduces the stress in all of the sucker rods located above it. The lifting force is applied to the rod string by the compensator piston. The high pressure of the fluid in the tubing acts on the bottom of this piston. The low pressure gas from the casing acts on the top of this piston. This difference in pressure across the piston causes a lifting force which substantially reduces the weight on the upper part of the rod string.

**This item supplements Fluid Packed Pump Company data on pages 1701-1756 of the Composite Catalog, 19th Edition.**

**Circle No. 8 on Postcard**

## Slip Dog Tags

"Slip Dog Tags" for easy identification of the proper slip dog for each pipe size are now included with every set of slip dogs manufactured by Mission Manufacturing Company. The aluminum metal tag is slipped under the rocker pin when the new set of dogs is installed. All assembled slips shipped from the plant will be equipped with the proper size dog tag for easy pipe size identification. Use of the dog tags should be of assistance to the men in the field in the use of Mission's rolling dog slips.

**This item supplements Mission Manufacturing Company data on pages 3437-3524 of the Composite Catalog, 19th Edition.**

**Circle No. 9 on Postcard**

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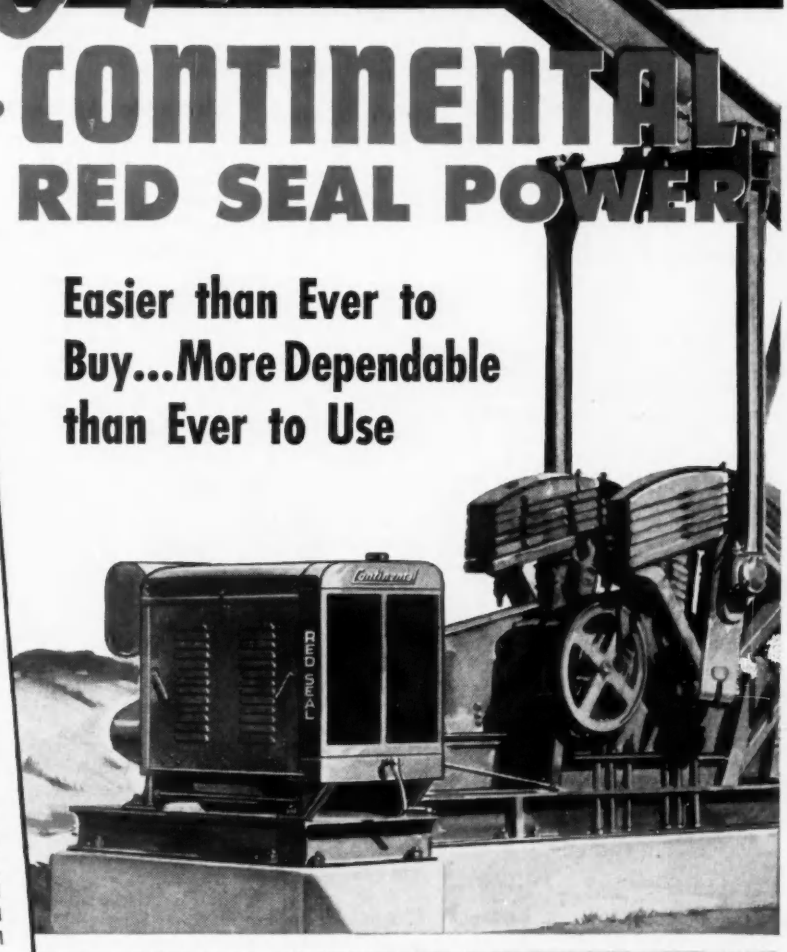
# Ask for it at your Supply Store ...CONTINENTAL RED SEAL POWER

## Easier than Ever to Buy...More Dependable than Ever to Use




**INDUSTRIAL GASOLINE ENGINES**

| Model | Cyl. | Bore | Stroke | Displ. | Bare Engine H.P. |
|---|---|---|---|---|---|
| N56 | 4 | 2¼ | 3½ | 56 | 14.2 @ 2200 RPM |
| N62 | 4 | 2⅜ | 3½ | 62 | 15 @ 2200 RPM |
| Y69 | 4 | 2½ | 3½ | 69 | 21.4 @ 2400 RPM |
| Y91 | 4 | 2⅞ | 3½ | 91 | 28.5 @ 2400 RPM |
| Y112 | 4 | 3 3/16 | 3½ | 112 | 32 @ 2400 RPM |
| F124 | 4 | 3 | 4⅜ | 124 | 36 @ 2400 RPM |
| F140 | 4 | 3 3/16 | 4⅜ | 140 | 42 @ 2400 RPM |
| F162 | 4 | 3 7/16 | 4⅜ | 162 | 49 @ 2400 RPM |
| F186 | 6 | 3 | 4⅜ | 186 | 60.5 @ 2400 RPM |
| F209 | 6 | 3 3/16 | 4⅜ | 209 | 68 @ 2400 RPM |
| F226 | 6 | 3 5/16 | 4⅜ | 226 | 73 @ 2400 RPM |
| F244 | 6 | 3 7/16 | 4⅜ | 244 | 79 @ 2400 RPM |
| M271 | 6 | 3⅝ | 4⅜ | 271 | 86.2 @ 2400 RPM |
| M290 | 6 | 3¾ | 4⅜ | 290 | 92.2 @ 2400 RPM |
| M330 | 6 | 4 | 4⅜ | 330 | 104.4 @ 2400 RPM |
| B371 | 6 | 4⅛ | 4⅝ | 371 | 110 @ 2400 RPM |
| B427 | 6 | 4 5/16 | 4⅞ | 427 | 127 @ 2400 RPM |
| J382 | 4 | 4½ | 6 | 382 | 78.3 @ 1500 RPM |
| G134 | 4 | 3⅛ | 4⅜ | 134 | 32.2 @ 2000 RPM |
| G157 | 4 | 3⅜ | 4⅜ | 157 | 37.7 @ 2000 RPM |
| H227 | 4 | 3⅝ | 5½ | 227 | 54 @ 2000 RPM |
| H243 | 4 | 3¾ | 5½ | 243 | 58.2 @ 2000 RPM |
| *H260 | 4 | 3⅞ | 5½ | 260 | 62 @ 2000 RPM |
| T371 | 6 | 4⅛ | 4⅝ | 371 | 119 @ 2400 RPM |
| T427 | 6 | 4 5/16 | 4⅞ | 427 | 140 @ 2400 RPM |
| U501 | 6 | 4½ | 5¼ | 501 | 160 @ 2400 RPM |
| R513 | 6 | 4½ | 5⅝ | 513 | 164.3 @ 2400 RPM |
| R572 | 6 | 4¾ | 5⅝ | 572 | 182.4 @ 2400 RPM |
| R602 | 6 | 4⅞ | 5⅝ | 602 | 191.7 @ 2400 RPM |
| S749 | 6 | 5⅜ | 5½ | 749 | 217 @ 2200 RPM |

**INDUSTRIAL DIESEL ENGINES**

| Model | Cyl. | Bore | Stroke | Displ. | Bare Engine H.P. |
|---|---|---|---|---|---|
| GD157 | 4 | 3⅜ | 4⅜ | 157 | 39 @ 2000 RPM |
| HD243 | 4 | 3¾ | 5½ | 243 | 54.7 @ 2000 RPM |
| *HD260 | 4 | 3⅞ | 5½ | 260 | 59.3 @ 2000 RPM |
| TD427 | 6 | 4 5/16 | 4⅞ | 427 | 106.5 @ 2000 RPM |
| RD572 | 6 | 4¾ | 5⅝ | 572 | 142.5 @ 2000 RPM |
| SD802 | 6 | 5 9/16 | 5½ | 802 | 184.3 @ 1800 RPM |

*Available for Industrial applications only.

**Now add *accessibility* to the many other good reasons for standardizing on Red Seals for oil field jobs within their power range. That range is a broad one, too: look at the list at left. It includes models for use on all standard fuels—each the product of more than 50 years' engine-building experience—each backed by parts and service facilities coast to coast.**

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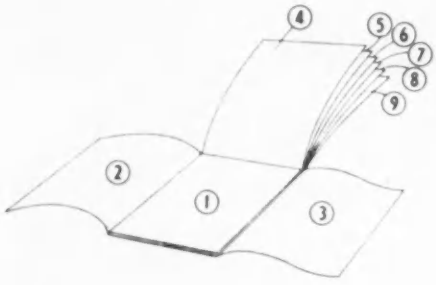
**Continental Motors Corporation**

MUSKEGON, MICHIGAN

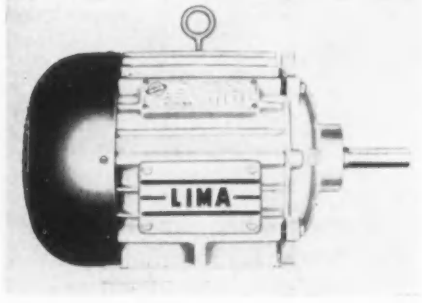
# Other New Equipment




## Overlayit Tablet

A tablet for use in preparing and presenting overlay illustrations has been introduced by Riley Reproduction Inc. Of interest to the geologist, the overlayit tablet consists of a heavy card stock base (No. 1 in sketch) for the basic drawing, three highly transparent matte-finish acetate sheets attached to the base, suitable for colored pencil or colored inks (Nos. 2, 3, and 7), three detachable tracing paper sheets for preliminary sketches (Nos. 4, 5, and 6), a fly sheet (No. 8), and cover (No. 9). This tablet, due to its construction, will allow examination of any one or more overlay drawings superposed on basic drawing. If more than three overlays are needed, individual cut sheets of matte-finish acetate may be purchased. The size is 8½ inches by 11½ inches.

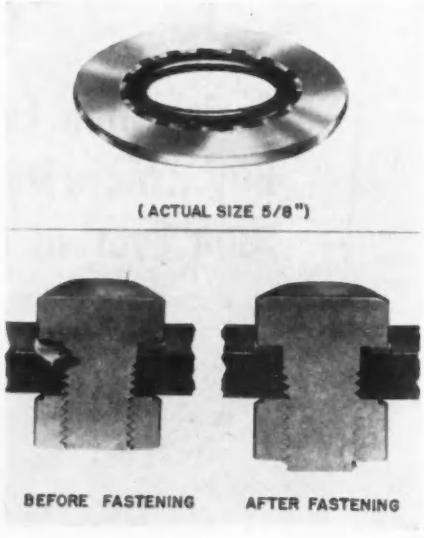
**Circle No. 10 on Postcard**




## Fan-Cooled Motor

The Lima Electric Motor Company is manufacturing a new design of totally enclosed, fan-cooled motor. The new Type E is available in ratings of three-quarter horsepower at 900 revolutions per minute to 20 horsepower at 3600 rpm in NEMA frame sizes 224 to 326 inclusive. Features include rigid, seasoned cast iron frames with integral feet and deep, integrally cast fins providing extra heat dissipating surface resulting in cooler operation. Double-width prelubricated sealed ball bearings require no greasing or cleaning for normal life; correct quantity of lubricant is sealed in, dirt and moisture sealed out. These motors can be supplied for vertical, wall or ceiling mounting, as well as standard horizontal floor mounting.

**Circle No. 11 on Postcard**




## D-C Arc Welder

Reductions in size and weight and increases in ease of maintenance and user and operator convenience are advantages of a new Westinghouse selenium rectifier d-c arc welder. This new welder incorporates the characteristic advantages of the selenium rectifier type welder—high efficiency with low no-load losses; a-c welding performance with d-c welding characteristics; and high dependability with low maintenance due to an almost complete lack of moving parts. The heart of the new welder consists essentially of two parts; a three phase, full wave selenium rectifier and a transactor unit which is a combination three-phase transformer and movable core reactor. Smaller and lighter, the transactor unit has two three-phase laminated cores.

Although the use of aluminum has been the major contributor to weight reductions, certain design modifications have resulted in decreased weight as well as size reduction, simplified construction, improved weather protection and better ventilation. Maximum cooling is afforded by axial-flow ventilation.

**Circle No. 12 on Postcard**

## Angular Cutter

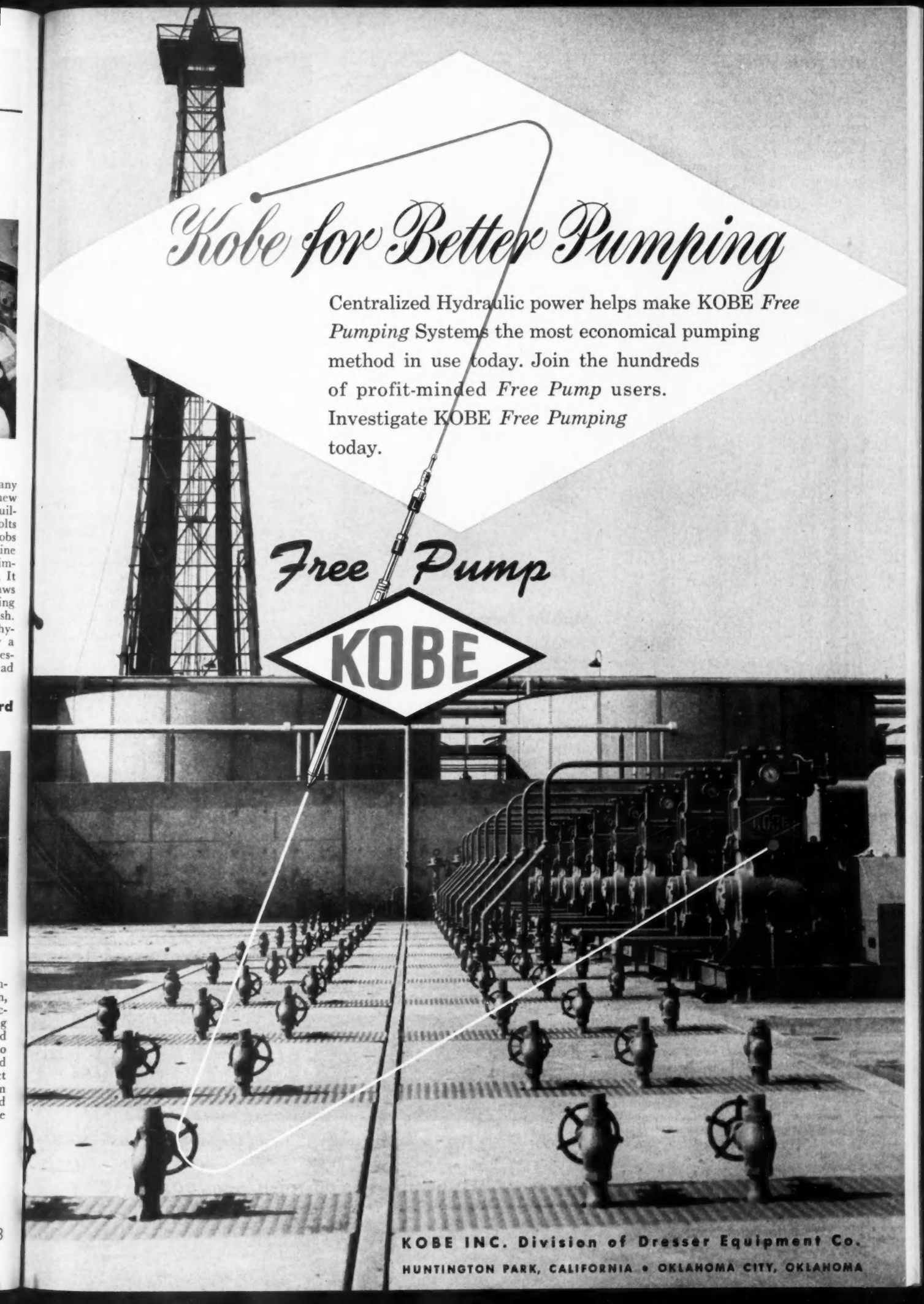
The Manco Manufacturing Company has anounced the development of a new hydraulic angular bolt cutter in the guillotine line design for flush trimming bolts to the nut or for other metal trimming jobs where a close cut is desired. The Guillotine angular bolt cutter has a capacity for trimming seven-eighths-inch mild steel bolts. It can also be obtained with cut back jaws for use in splitting nuts during wrecking operations or for trimming wire mesh. Power is supplied through a portable hydraulic pump. The unit is actuated by a manual lever which eliminates the necessity of solenoid switches. The cutting head weight is 23 pounds.

**Circle No. 13 on Postcard**

## Pipe Line Oil Sampler

McFarland Engineering and Pump Company recently announced the completion, testing, and availability of the new McFarland Pipe Line Oil sampler. Operating entirely from the line flow, the McFarland Sampler (patent pending), with sizes to fit all standard pipe lines, has a calibrated head which enables the operator to select the exact amount of sample desired from 0 up. The amount selected is guaranteed to remain constant regardless of the rate

***Save time! Keep informed! Circle numbers on postcard, page 301***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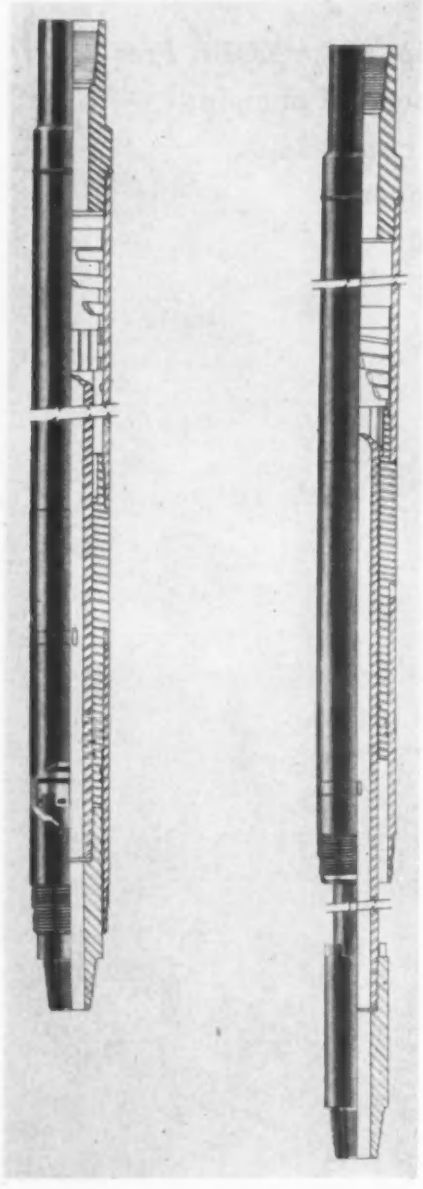
of flow. If the fluid stops, the sampler stops. Easily installed, the sampler does not restrict the flow of the fluid and can be removed and plate put on line adapter without again breaking into the line. Minimum of moving parts operating in the oil flow assures long life.

**Circle No. 14 on Postcard**



## Fishing Tool

A new back-off fishing tool proved in service in more than 250 back-offs from depths of 2000 to 12,000 feet has been announced by the Tri-State Oil Tool Company. In actual field tests the new tool has been able to recover several thousand feet of pipe that has not been washed over and, in some cases, the entire string. The tool is connected to the wash pipe by means of a washover safety joint. When washover is completed, the tool is attached to the fish by screwing into tool joint or by means of spear, overshot or tap. Each tool is constructed with sufficient tensile and torsional strength to withstand any force that may be applied with the drill pipe on which it is designed to run. When the back-off is at the desired depth, the wash pipe is picked up enough to engage clutch, reverse torque is applied and back-off is made in usual manner. The tool is available in three sizes as follows: 7¾-inch outside diameter by three-inch inside diameter; 5⅝-inch outside diameter by 2¼-inch inside diameter; and 4-inch outside diameter by 1⅝-inch inside diameter. The cutaway photograph shows the tool in back-off position at left and in washover position, right.

**Circle No. 15 on Postcard**

## Mobile Two-Way Radio

Motorola Inc. has added several mobile models to its diversified line of 25-54 mc. F.M. two-way radio equipment. These new 30 and 60 watt models feature innovations such as universal 6-12 VDC operation, dual interrupter vibrator power supply and drastically reduced primary power drain. A newly developed extra long life all-vibrator power supply attains 70 percent power conversion efficiency compared to conventional 55 percent efficiencies which together with other power economies designed-in produces an overall drain reduction of almost 50 percent. When operating from a six-volt battery, the new 60 watt model requires 10.5 amps on standby and only 43 amps during transmit periods which is the equivalent power requirement of conventional 30 watt equipment. Power drain of the new 30 watt unit is approximately equal to that of a conventional 10 watt transmitter-receiver combination. The new radio sets may be used interchangeably in 6 and 12 volt vehicles without revising internal wiring. All power conversion is accomplished automatically in the external cabling and connectors which are unique for 6 or 12 volt operation.

The newly introduced equipment, designed for automobile trunk installation, utilizes separate transmitter, receiver and power supply chassis assembled into a compact drawer type housing. All operational accessories, including a highly functional dash mounted control unit are included as a part of each model.

**Circle No. 16 on Postcard**

## Centrifuge

The Protek centrifuge is designed to provide an efficient means of separating samples containing liquids of different weights by centrifugal process. The gear ratio permits convenient operation within the speeds prescribed by the ASTM and the API. Features include its light weight caused by castings of high strength aluminum alloy; its worn gear drive for easier turning and longer gear life; and its bearing-supported shafts. Both the crank and spindle shafts are supported by two bearings each to insure proper alignment. All bearings are self-lubricated and require no maintenance. Models available from Protek Specialty Company are Model 152 for 2-15 ml tubes and Model 1002 for 2-100 ml tubes.

**Circle No. 17 on Postcard**

## Sealing Device

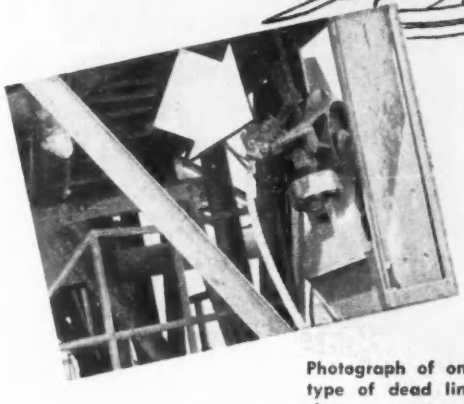
A new sealing device for sure sealing of bolts and studs at either high or low pressure, gas liquids or air has been developed by Franklin C. Wolfe Company. Called the Stat-O-Seal, this new device uses the principle of controlled confinement of the sealing gland as proved in the company's Lock-O-Seals. The Stat-O-Seal is one piece construction and non-directional. It cannot be assembled upside down. The O ring sealing gland in the Stat-O-Seal is mechanically fastened to the metal retainer which eliminates the possibility of failure of a chemical bonding agent. Use of the Stat-O-Seal eliminates the need for sealing "goop" over bolts and studs. They do not require high fastening torques to seal as there is always full metal to metal contact without any load transference to the sealing gland.

**Circle No. 18 on Postcard**

***Save time! Keep informed! Circle numbers on postcard, page 301***

PAGES FROM THE LEBUS WIRE LINE SPOOLING HANDBOOK

# Cutting Off Is Important to Wire Line Performance



Photograph of one type of dead line clamp recommended so that the line can be slipped through safely and quickly to prepare for making drum end cut-offs when changing the load-lifting position of the wire line on the drum, the crown block and traveling block sheaves.

You may think the above cartoon is silly, but this is actually how some drum end cuts are made. LeBus *does not* recommend a system such as this.

So that the operator can get the best line performance and greatest amount of line service per dollar spent, it is very important that he use a regular system of moving the line forward and cutting off at the drum. Drum end cuts should be made according to ton-mile records, and the number of feet cut off should be based on drum core circumference. The cut off portion should be an even number of wraps plus one-half or one-third. This procedure changes the load lifting position on the crown block, traveling block, sheaves and drum core where the line has had excessive wear, and these load lifting positions should be checked carefully for bad sections. In case of excessive line punishment after pulling on stuck drill pipe, or setting heavy strings of casing, the line should be inspected thoroughly and positions should be changed more often.

The LeBus Grooving and Spooling System* offers many time-saving advantages for cutting off. The LeBus method of spooling and their cutting-off formula is fully explained and demonstrated to crews at the time the grooving installation is made so that every advantage pays off for the operator.

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*Patented and Other Patents Pending

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Tuboscope . . . . . 5198, 5218
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# New Catalogs and Equipment Literature

## Corrosion Control Equipment

The Cathodic Protection Service Company has published a new catalog containing some 75 pages and listing over 700 different items used by Cathodic Protection and corrosion control engineers. Known as Catalog No. 54, this book also contains a technical data section which should prove invaluable to those engaged in this work.

**Circle No. 19 on Postcard**

## Piping and Pressure Vessels

A house organ has been issued by Taylor Forge & Pipe Works which is designed to help engineers and designers. Available upon request to persons interested in the problems dealing with piping and pressure vessels, the first issue deals with the basis used by the Codes for establishing allowable stresses and contains tables of maximum allowable stresses ASME boiler and pressure vessel code. Other tables and illustrations are presented.

**Circle No. 20 on Postcard**

## Ropes and Cables

A booklet describing properties and qualities of Wirelon ropes has been published by Rochester Ropes, Inc. Constructed of high tensile steel strands and tough, durable nylon, Wirelon is available in a complete range of sizes, strengths, and other physical characteristics. It has numerous applications in the petroleum industry. Description and specifications of Wirelon are given in the bulletin.

**Circle No. 21 on Postcard**

## Joint Design Guide

A new Flexon expansion joint design guide has been released by Flexonics Corporation, formerly Chicago Metal Hose Corporation. The catalog contains engineering application and selection data necessary to the proper solution of pipe line expansion problems. The guide includes a discussion of the various types of expansion joints on the market, the types of Flexon expansion joints available and types of pipe line motion solved by expansion joints. Design considerations, installation instructions and selection data are covered. The center spread of the catalog is devoted to a schematic piping layout illustrating various expansion joint applications and principles.

**Circle No. 22 on Postcard**

## Pump Bulletin

A new 20-page brochure issued by Marlow Pumps describes oil country pumps and the part they play in locating, producing, transferring and refining oil. The bulletin illustrates a wide range of Marlow pumps with scenes covering various types of installation. Design and performance features are discussed for the various models illustrated. The brochure has sections on exploration and geophysics, drilling, production, pipe lines and refining. A resume of Marlow facilities available to the oil industry is included.

**Circle No. 23 on Postcard**

## Measuring Equipment

A revised edition of the General Electric Company's 64-page measuring equipment catalog containing information on more than 115 testing and measuring devices for laboratory and production line use has been announced as available from the company. The fully illustrated publication contains information on products ranging from simple current indicators to completely automatic oscillographs; from surface roughness scales to mass spectrometers; from d-c amplifiers to radiation monitors.

**Circle No. 24 on Postcard**

## Jet Casing Cutters

A new four-page illustrated technical bulletin on jet casing cutters has been released by the McCullough Tool Company. Description of the applications and operation of McCullough jet casing cutters are given and full details on the use of these wire line tools in casing recovery operations are described.

**Circle No. 25 on Postcard**

***Circle numbers on postcard, page 301***

## Safety and Relief Valves

An illustrated 12-page circular describing the company's complete line of pop safety and relief valves for steam, air, gas, water, oil and other liquids has been published by The Lunkenheimer Company. Complete with leading dimensions this circular comprises much valuable information in the form of steam, air and gas relieving capacity table. Also featured is a table of multipliers for computing relieving capacities at various inlet temperatures and another table of multipliers permits computing relieving capacities for air valves for use in handling gases and vapors.

**Circle No. 26 on Postcard**

## Portable Pipe Line Couplers

The complete line of larger couplers and fittings for portable industrial pipe lines is described in a new folder by Wade Manufacturing Company. Jobs selected for illustration in the folder were chosen to show efficiency of the equipment under a variety of conditions and uses. Designed as a light weight, quickly attached, strong coupler particularly adapted to field use of portable pipe lines, "Quick-Lok" couplers are used by contractors in mining, in the oil industry, and wherever air, liquids, fuel or chemicals must be handled with safety and speed.

**Circle No. 27 on Postcard**

## Junk Catcher

An illustrated folder showing the features and advantages of the Globe "2 in 1" junk catcher has been completed by Globe Oil Tools Company. The globe junk catcher is available with a magnet-type catcher which is interchangeable with the regular globe dog-type catcher. This is important to operators because only one complete outfit is required in the rig, yet has the advantage of two entirely different type catcher outfits.

**Circle No. 28 on Postcard**

## Radiator Products

Young Radiator Company has prepared 41 different catalogs describing heat transfer products manufactured by the company. Among the many bulletins are catalog No. 253 on air conditioning units, unit heaters, heating and cooling coils, and convectors; Catalog No. 353 covering products for chemical, industrial and oil field applications; catalog No. 2548-A on Type "SH" horizontal unit heaters; catalog No 2752 on gas fired unit heaters; and catalog No. 4553 on heating coils by Young.

**Circle No. 29 on Postcard**


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Is Work-Tested . . .
Before It Leaves the Factory

. . . to make sure
it gives you the
Best and the Most
wrench service for your money

The reason RIDGID Heavy-Duty Pipe Wrenches are known for the brutal punishment they can take is because of the toughness built into them, checked part by part and then hard work-tested when assembled . . . not just one wrench in 100 or 1000 but *every last one!* . . . Add the guaranteed repair-free housing, no-slip no-lock jaws, handy pipe scale, easy spinning adjustment nut and comfort-grip I-beam handle and you see why genuine RIDGID gives you the big value for your money. Buy them at your Supply House.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO

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Work-Saver Pipe Tools

# *Catalogs* AND EQUIPMENT *Literature* OFFERED IN THIS ISSUE'S ADVERTISEMENTS

**Copies may be obtained easily and without cost by using the Reader Service Postcard on Page 301. Just circle on the card the number at the end of each item in which you are interested.**

MACHINE SHOP SERVICE—Information. Acme Foundry & Machine Co. See page 336.
*Circle A1 on postcard.*

TUBING SPIDER—Bulletin TS-54. Advance Oil Tool Co. See page 222.
*Circle A3 on postcard.*

AERIAL SURVEYS—Information. Aero Service Corp. See page 115.
*Circle A4 on postcard.*

GAS AND OIL ENGINES—Bulletin 512. Ajax Iron Works. See page 207.
*Circle A6 on postcard.*

PUMPS—Catalogs. The Aldrich Pump Co. See page 218.
*Circle A7 on postcard.*

LIQUID GRAVITOMETER—Bulletin No. 111-A. American Recording Chart Co. See page 326.
*Circle A13 on postcard.*

COUPLINGS AND HOSE ASSEMBLIES—Information. Anchor Coupling Company. See page 41.
*Circle B5 on postcard.*

SUCKER RODS—Bulletin 5306. Axelson Manufacturing Co. See pages 176-177.
*Circle B7 on postcard.*

SCRATCHERS AND CENTRALIZERS—Ruler. B & W Incorporated. See page 106.
*Circle B8 on postcard.*

PROTECTIVE COATINGS—Information. The Barrett Division, Allied Chemical & Dye Corp. See page 247.
*Circle C2 on postcard.*

PACKAGED COMPRESSOR PLANTS—Information. The J. B. Beaird Co. See page 241.
*Circle C3 on postcard.*

FITTINGS—Catalog 153. The J. B. Beaird Co. See page 242.
*Circle C4 on postcard.*

PIPE AND BOLT MACHINE—Catalog. Beaver Pipe Tools, Inc. See page 335.
*Circle C6 on postcard.*

BLANKS—Booklet 216. Bethlehem Steel Co. See page 67.
*Circle C7 on postcard.*

SUCKER RODS—Information. Bethlehem Steel Co. See page 217.
*Circle C9 on postcard.*

AUTOMATIC FLOW CONTROLS—Literature. S. R. Bowen Company. See page 345.
*Circle C13 on postcard.*

EXPLOSION-PROOF RADIATOR—Folder. Burnham Corp. See page 327.
*Circle D1 on postcard.*

ROTARY BRUSH CUTTER—Information. E. L. Caldwell & Sons. See page 250.
*Circle D5 on postcard.*

PLASTIC PIPE—Catalog. Carlon Products Corp. See page 42.
*Circle D8 on postcard.*

SWING CHECK VALVES—Catalog 11. Catawissa Valve & Fittings Co. See page 333.
*Circle D9 on postcard.*

DRILL COLLARS—Manual. Chicago Pneumatic Tool Co. See page 313.
*Circle E1 on postcard.*

HAND CRANES—Information. Coffing Hoist Co. See page 220.
*Circle E5 on postcard.*

BOOSTER COMPRESSORS—Information. The Continental Supply Co. See page 237.
*Circle E9 on postcard.*

BRASS GATE VALVES—Folder AD1944. Crane Company. See page 26.
*Circle E13 on postcard.*

PLASTIC LEAD SEAL—Sample. Crane Packing Co. See page 331.
*Circle F1 on postcard.*

COATING AND WRAPPING PRODUCTS—Literature. The S. D. Day Co. See page 328.
*Circle F3 on postcard.*

HYDRAULIC PUMPS, MOTORS AND CONTROLS—Information. The Denison Engineering Co. See page 50.
*Circle F5 on postcard.*

NEOPRENE NOTEBOOK—E. I. du Pont de Nemours & Co. See page 105.
*Circle F11 on postcard.*

LIQUID LEVEL CONTROLLER—Bulletin F-3. Fisher Governor Co. See page 88.
*Circle G6 on postcard.*

PACKINGS, PISTON RINGS AND VALVE DISCS—Information. France Packing Company. See page 310.
*Circle G8 on postcard.*

MARINE EXPLORATION SERVICE—Folder. Geophysical Service, Inc. See page 10.
*Circle G13 on postcard.*

ATTRACTOMETER — Information. Geophysical Survey Syndicate. See page 335.
*Circle H1 on postcard.*

NON-SKID SAFETY MATERIAL—Catalog. The Globe Company. See page 335.
*Circle H2 on postcard.*

ROTARY HOSE COUPLINGS—Details. The Goodyear Tire & Rubber Co. See page 7.
*Circle H3 on postcard.*

REAMERS—Bulletin 62. Grant Oil Tool Co. See page 145.
*Circle H5 on postcard.*

PETROLEUM BOOKS CATALOG—The Gulf Publishing Company. See page 212.
*Circle H10 on postcard.*

DRILLING BITS—Catalog. Herb J. Hawthorne, Inc. See page 113.
*Circle J2 on postcard.*

LEASE RENTAL HOUSING — Details. Houston Ready-Cut House Co. See page 294.
*Circle J5 on postcard.*

ROTATING SCRAPERS—Catalog. J. M. Huber Corp. See page 348.
*Circle J6 on postcard.*

OIL FIELD TOOLS—Details. Hunt Tool Co. See page 318.
*Circle J9 on postcard.*

BEARINGS—Information. Hyatt Bearings Division, General Motors Corp. See page 131.
*Circle J11 on postcard.*

PUMPING UNITS—Catalog. Jensen Brothers Manufacturing Co. See page 204.
*Circle K1 on postcard.*

LUBRICATION APPLICATOR—Details. Jet-Lube, Inc. See page 336.
*Circle K2 on postcard.*

DYNAMOMETER—Bulletin No. 25. Johnson-Fagg Engineering Co. See page 202.
*Circle K3 on postcard.*

RELIEF VALVE—Bulletin RV412. Kinzbach Tool Co. See page 341.
*Circle K12 on postcard.*

WIRE LINE SPOOLING HANDBOOK—LeBus International Engineers Ltd. See page 309.
*Circle L10 on postcard.*

WIRE ROPE HANDBOOK—Leschen Wire Rope Division. See page 297.
*Circle L11 on postcard.*

WIRE ROPE—Information. Macwhyte Company. See page 11.
*Circle M5 on postcard.*

NEEDLE VALVES—Catalog. Jas. P. Marsh Corp. See page 31.
*Circle M8 on postcard.*

PLUNGERS—Catalog. John N. Martin, Manufacturer. See page 214.
*Circle M9 on postcard.*

FREE POINT FINDER AND STRING SHOT BACK-OFF—Technical Bulletin No. 402. McCullough Tool Co. See page 347.
*Circle M11 on postcard.*

SNATCH BLOCK—Catalog. McKissick Products Corp. See page 324.
*Circle M13 on postcard.*

LIQUID LEVEL CONTROLS—Bulletin 39S. The Mercoid Corp. See page 343.
*Circle N1 on postcard.*

PHOSPHATES FOR MUD CONTROL—Information. Monsanto Chemical Co. See page 48.
*Circle N4 on postcard.*

DRILL COLLAR JOINTS—Bulletin 398. The National Supply Co. See pages 71-74.
*Circle N7 on postcard.*

HYDRAULIC PUMPS—Information. The New York Air Brake Co. See page 213.
*Circle N9 on postcard.*

SLUSH PUMP LINERS, LINER PACKING ASSEMBLIES AND LINER PULLERS—Catalogs No. P-120, P-121 and P-122. Oil Well Manufacturing Corp. See page 321.
*Circle N12 on postcard.*

ELECTRIC PLANT—Information. D. W. Onan & Sons, Inc. See page 346.
*Circle P1 on postcard.*

WEED KILLER—Literature. Pacific Coast Borax Co. See page 322.
*Circle P3 on postcard.*

PLUNGERS—Technical Bulletin No. 201. Pacific Pumps, Inc. See page 216.
*Circle P4 on postcard.*

PUMP ANCHOR—Information. Page Oil Tools, Inc. See page 315.
*Circle P5 on postcard.*

CENTRIFUGE—Literature. Protek Specialty Co. See page 294.
*Circle P11 on postcard.*

BOOSTER STATION MICROWAVE SYSTEM AND PUSHBUTTON OPERATION OF BOOSTERS—Booklets. Radio Corporation of America. See page 231.
*Circle P12 on postcard.*

PUMPING EQUIPMENT—Information. J. P. Ratigan, Inc. See page 40.
*Circle P13 on postcard.*

HOSE, V-BELTS, TRANSMISSION BELTS, BRAKE LINING AND PACKING—Catalog 6903. Raybestos-Manhattan, Inc. See page 317.
*Circle Q1 on postcard.*

BLOWOUT PREVENTER — Information. Regan Forge & Engineering Co. See page 290.
*Circle Q5 on postcard.*

PLASTIC PIPE—Booklet No. 603. Republic Steel Corp. See pages 28-29.
*Circle Q7 on postcard.*

WELLCHECKERS—Bulletin 1951-W. Rolo Manufacturing Co. See page 220.
*Circle Q11 on postcard.*

PRESSURE CONTROL EQUIPMENT—Catalog. Shaffer Tool Works. See page 45.
*Circle R3 on postcard.*

CABLE TOOLS—Catalog. Spang & Company. See page 329.
*Circle R10 on postcard.*

LEVER JACK—Information. Templeton, Kenly & Co. See page 336.
*Circle S1 on postcard.*

CORROSION PREVENTIVE—Information. Tretolite Company. See page 171.
*Circle S5 on postcard.*

CORROSION RESISTANT MATERIALS—Data Booklet. Tube-Kote, Inc. See page 332.
*Circle S7 on postcard.*

TORQUE CONVERTERS—Information. Twin Disc Clutch Company. See page 168.
*Circle S10 on postcard.*

WIRE ROPE FOR WELL DRILLING—Handbook. Union Wire Rope Corp. See page 32.
*Circle S11 on postcard.*

HYDRAULIC PUMPING EQUIPMENT—Bulletin No. 52-51. Vickers Incorporated. See page 344.
*Circle T2 on postcard.*

PLAIN END PIPE COUPLING—Catalog No. 44-81. Victaulic Company of America. See page 169.
*Circle T3 on postcard.*

POWER PLANTS—Bulletin 1560. Waukesha Motor Company. See page 30.
*Circle T8 on postcard.*

MAGNETOS AND MAGNETO-MOUNTED DISTRIBUTORS—Information. Wico Electric Company. See page 339.
*Circle U4 on postcard.*

HOLLOW SUCKER RODS—Information. Wilson Supply Co. See page 18.
*Circle U7 on postcard.*

SHOT HOLE RIGS—Catalog No. 8. Winter-Weiss Company. See page 300.
*Circle U9 on postcard.*

CONTINUOUS WELD PIPE—Folder. The Youngstown Sheet & Tube Co. See page 224.
*Circle U12 on postcard.*

The straight, smooth inside bore of rugged CP Drill Collars eliminates washouts caused by offsets. Uniform outside hardness for the entire length of the collar greatly reduces rotation wear. Concentric, uniform thickness of wall sections provides rigidity throughout and perfect balance to overcome whipping and warpage — assures equal stress at all connections.

Threading is tailor-made to your specific requirements—all threads are hobbed on a thread mill for perfect uniformity and alignment. Available on special order in any length up to 55 feet. Write for Drill Collar Manual. *Chicago Pneumatic Tool Company, Oil Tool Division, 5000 U.S. Route 81 South, Fort Worth, Texas.*

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# What's Happening

## AMONG MEN IN THE INDUSTRY

**J. E. Heston,** coordinator of oil production for Cities Service Oil Co. (Del.) in New York, has been elected vice president and director of Cities Service, principal member of the Cities Service system. He will assume his new duties immediately in the Bartlesville, Okla., headquarters of the company. A native of Oklahoma, Heston became associated with Cities Service in 1930 as a geological scout after receiving his B. S. degree in geology from the University of Oklahoma. Heston held various geological and engineering positions in the Cities Service system until 1941, when he went to Washington as assistant director of production, Petroleum Administration for War. He returned to Cities Service in 1945.

J. E. Heston

•

**Henry L. Waszkowski, Jr.,** who has been assistant district superintendent of Magnolia Petroleum Company's Falfurrias producing district, has been transferred to the New York office of Socony-Vacuum Oil Company, Inc. He has been succeeded as assistant district superintendent by Homer A. Martin, who has been production foreman in the Falfurrias district.

•

**Garland C. Rutherford,** production foreman for Magnolia Petroleum Company, has been transferred and promoted to assistant district superintendent of the Duncan, Okla. district. **G. W. Walker,** pertoleum engineer, has been made assistant foreman for Magnolia in its Falfurrias producing district.

•

**John O. Campbell,** The Carter Oil Company, Tulsa, has been promoted from head of the company's natural gas and gas products section to assistant manager of the Crude Oil Purchasing department.

•

**Arthur P. Allison,** district geologist for The Sun Oil Company, has retired after 23 years of service. Allison has been in Shreveport since 1947 when he opened a district geological office for Sun. Joining Sun as a field geologist at Brenham, Texas, in 1930, Allison moved to Lufkin in the same capacity. He was made a field clerk in the Henderson area, East Texas in 1931 and a year later went into the Land department as a scout at Livingston, Texas. Allison was moved to Houston in 1934 as a sub-surface geologist, was promoted to district geologist in 1935 and stayed there until his transfer to Shreveport. Sun's office in Shreveport will be under the supervision of district geologist **D. C. Harrell** of Jackson, Miss. **Frank Craver** is in charge of local activities now in Shreveport.

**Walter M. Wilkinson** has resigned from Sohio Petroleum Company to become a vice president of Hanley Company. Wilkinson will manage the land and exploration activities of Hanley's Oil Division and will make his headquarters in Midland, Texas. At the time of his resignation, Wilkinson was division geologist for Sohio's Mid-Continent Division located in Oklahoma City. Joining Sohio in 1946 at Wichita, Kansas, he later became the company's district geologist at Abilene and Midland. Prior to joining Sohio, Wilkinson was associated with Phillips Petroleum Company.

•

**John M. Peirce,** vice president and general manager of the Western Oil and Gas Association, has resigned his position to accept the appointment as director of the Department of Finance of the State of California under the state's Governor Goodwin Knight. Peirce has served as fiscal advisor to the Department of Finance and the State Legislature for more than 20 years.

•

**Lewis McGuire,** Geneseo, Kansas, has been promoted from assistant superintendent to superintendent of Continental Oil Company's East Kansas production district. He will continue to make his headquarters at Geneseo. McGuire succeeds **J. P. Neel,** who has retired. McGuire joined Conoco in 1936 as a roustabout at Seminole, Okla. He became district clerk at Geneseo in 1940 and was promoted in 1949 to assistant district superintendent.

•

**Gay Carroll,** comptroller of Humble Oil & Refining Company since 1940, has retired from service with the company. **O. L. Luper,** assistant comptroller, has been elected by the board of directors to succeed Carroll. Carroll has more than 35 years service with Humble, starting in 1918 as a price clerk in the Warehouse department. Luper joined the Comptroller's department at Humble in 1946 and was promoted successively to assistant general auditor and general auditor. He has been assistant comptroller since December, 1952.

•

**Clarence L. Moody,** formerly staff research geologist, Shreveport, La., retired from The Ohio Oil Company after completing more than 35 years of service. Moody was president of the American Association of Petroleum Geologists in 1950 and previously served as editor of the A.A.P.G. Bulletin. A graduate of the University of California, Moody had two years practice as consulting geologist in California and Wyoming before joining Ohio Oil in 1918. He advanced in 1921 to Shreveport Division geologist and in 1950 was promoted to the chief geologist's staff.

•

**Robert C. Hadden** has been promoted to the newly-created position of assistant manager of the Crude Oil and Products department of Tide Water Associated Oil Company's Western Division. Hadden, who has been operating assistant of the same department, will operate from the company's San Francisco headquarters.

**F. H. Rathjen** has been appointed manager of Shell Oil Company's Tulsa area Gas department. He succeeds **R. S. Harris** who will assume a special assignment with the company. Rathjen has been with the company for 16 years. He first joined Shell as a technical assistant in Louisiana at the Norco refinery. In 1945 he was appointed assistant manager, Alkylation department at the Wood River, Ill., refinery. After a two-year assignment in Venezuela, Rathjen was named superintendent of the Elk City plant. Prior to his present promotion, he has been on special assignment visiting various company installations.

F. H. Rathjen

•

**C. C. (Mike) Harter** has been elected vice president of Oil and Gas Property Management, Inc., Dallas. A graduate of Texas Christian University, Harter has been employed by Continental Oil Company, DeGolyer and MacNaughton and San Juan Oil Company prior to his affiliation with Oil and Gas Property Management, Inc.

•

**J. H. Cobb** of San Antonio, Texas, has resigned from Continental Oil Company to become an independent operator dealing in leases and royalties. His office is at 1428 Milam Building in San Antonio.

•

**Lovett C. Peters** has been elected financial vice president of Continental Oil Company. Peters has been living in St. Louis since 1949 where he has been financial vice president with the Bankers Trust Company of New York, for 13 years, serving four years as assistant treasurer. He will make his new headquarters in Houston.

•

**Charles G. Hess, Jr.,** has been named corporate secretary of Lone Star Gas Company to succeed **T. J. Uhl,** who retired after 34 years with the company. **Miss Mary Emison** has been appointed assistant secretary of the company. Hess joined the company in 1924 and Miss Emison has been with the company since 1926.

•

**David B. Remick** has resigned his position with Pan American Production Company, Houston, to open a consulting geologist office at 345 Bank of Commerce Building, Houston. A graduate of Colgate University, Remick received his M.S. from the University of Texas and served three years as geologist for Magnolia-Abercrombie in Houston. Later he was geologist with Magnolia Petroleum Company in the Gulf Coast District of Louisiana and the Texas Gulf Coast district. From 1951 until October, 1953, Remick was exploratory, research geologist for Pan American Production Company.

# PAGE* TYPE "J"

## INSERT PUMP ANCHOR

1. **NO ROUND TRIPS TO CHANGE PUMP POSITION**
2. **NO PREMATURE SETTING**
3. **RUGGED PACKER ELEMENT**

The Page type "J" Pump Anchor eliminates the cost of pulling tubing every time the pump position is changed. In fact, the pump and anchor can be picked up and repositioned while by-passing the fluid.

The setting and unsetting operation is simple and positive. TO SET: (1) With pump anchor at desired depth lower rods slightly, apply slight left hand torque and lower again until slips set. (2) Apply weight of sucker rods to set packer and lock split cone to mandrel. (3) Space pump for PUMPING UP.

Incorporated in the Page type "J" Insert Pump Anchor is an exclusive pack-off which permits re-setting without replacing packer. Unique Page design eliminates cold flowing of the rubber packer.

This tool is designed with large fluid passageways and ruggedly built throughout. Available in 2″, 2½″ and 3″ sizes. Write or wire for prices and delivery.

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**PAGE**

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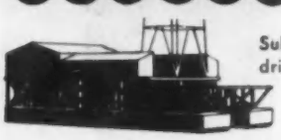
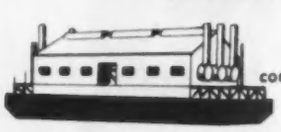


Submersible drilling barges

Tugs



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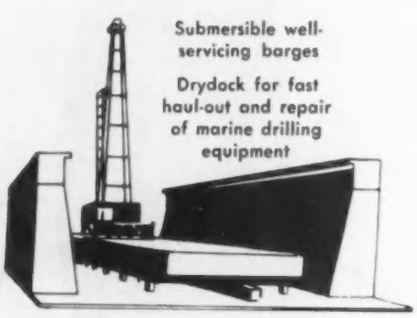

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Orange, Texas

Sam C. Oliphant

James Nash

**Sam C. Oliphant** and **James Nash** have been elected vice presidents of the Tennessee Production Company of Houston. Oliphant of Houston, formerly the company's director of geology and engineering, will continue in charge of those activities. Nash will maintain headquarters in Wichita Falls, Texas, as vice-president—northern division, including the company's properties in North and West Texas and Oklahoma. Oliphant received his B.S. and M.S. at the University of Texas. He was connected with Stanolind Oil and Gas Company from 1941 to 1953, the last five years as assistant division superintendent, Gulf Coast operating area, overseeing engineering, production, drilling and field geology. He resigned to join Tennessee Production January 1, 1953. Nash, a graduate of Yale and the Harvard Business School, was a geologist with Shell Oil Company at Tulsa from 1933 to 1936 and from 1937 to 1941, he was employed in the Accounting and Engineering departments of The Carter Oil Company at Tulsa. In 1941 he joined Reno Oil Company at Wichita Falls as western manager and was elected vice president and western manager in 1950. Properties of recently-liquidated Reno Oil were purchased by Tennessee Production.

•

**Lloyd Alexander** has announced the opening of a petroleum consulting office in the Commercial Building in Shreveport, La. He will engage in general petroleum consulting, specializing in production and drilling problems and reports for operators, investors and state regulatory bodies. Alexander has been engaged in the drilling and producing of oil and gas for the past 24 years and recently was drilling and production superintendent for the Southern Natural Gas Company.

•

**Joseph T. Kent**, valuation engineer, announces the opening of offices in Dallas as consultant in estate and income tax matters specializing in oil and gas engineering and valuation. Kent recently retired after more than 30 years of service with the U. S. Bureau of Internal Revenue. A graduate of Columbia School of Mines in 1916, Kent worked as a geologist with The Texas Company for six years before joining the Bureau of Internal Revenue at Washington in 1923.

•

**George W. Marshall, Jr.**, division geologist for Continental Oil Company at Roswell, N. M., has been promoted to the newly created position of assistant regional geologist for the southwestern area with headquarters at Fort Worth. **G. H. Galny**, assistant to the southwestern regional geologist at Fort Worth, is promoted to division geologist to succeed Marshall. Replacing Galny is **J. B. Brown**, geologist at Fort Worth.

CUT STUCK SAND LINES IN THE WELL

KINLEY SAND LINE CUTTER

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Wireline Specialties Co. - - - - - - 3-2196

HOBBS
Horne Well Service Co. - - - - - - - 3-5396

HOUSTON
Adair Service Co. - - - - WE-6497, PR-4652
Tuboscope - - - - - - - JU-0577, MO-4279

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Luccous - - - - - - - - - - 4-8471, 4-4320

NEW IBERIA
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Rectorseal has proved to be the only compound that assures leak-proof joints in LP Gas underground storage tubing strings. Rectorseal is your perfect sealant because it's sure, easy-to-use, economical.

It never hardens—never gets brittle. It's thin in the can but thickens in the joint to a plastic elasticity that assures a positive seal for the life of the connection. Make a test—try the best. There's no seal like Rectorseal. Ask for Rectorseal by name at your Supply Store. If they can't supply you, write

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MAKING THE OIL INDUSTRY SAFER

**J. Ed. Warren**, former Deputy Administrator, Petroleum Administration for Defense, is joining The National City Bank of New York as petroleum consultant. As head of the bank's Petroleum department, Warren will have associated with him **Bernard T. Stott**, assistant vice president, and **James E. Gallagher**, assistant cashier, both of whom have been active in National City Bank's contacts with the petroleum industry. Warren is a past president of the IPAA and AAOWDC, and holds membership in the National Petroleum Council, AAPG, AIMME, and API.

J. Ed. Warren

•

**H. A. Metzger** will join the Creole Petroleum Corporation March 1, 1954, to assume charge of the New York office. He will replace **C. L. Burrill**, vice president and director, who resigns in March to become head of the General Economics department of Standard Oil Company (New Jersey). A graduate of Cornell University, Metzger's career has been in South America where he held various positions in affiliates of Standard Oil Company (New Jersey), particularly in Colombia, Bolivia and Argentina. Since 1944 he has been president and general manager of the company's Argentine affiliate.

•

**Rick P. Clinton**, formerly of Savannah, Ga., has joined the geological staff of The Pure Oil Company at Oklahoma City.

## Transfers and Promotions . . .

Magnolia Petroleum Company's producing division has announced the following promotions in the Petroleum Engineering department: **O. E. Van Meter, Jr.**, assistant division petroleum engineering at Houston, promoted to specialist in the Petroleum Engineering department in Dallas; **A. H. Massad**, district petroleum engineer at Drumright, promoted to assistant division petroleum engineer of the Gulf Coast division with headquarters at Houston; **I. B. Stitt, Jr.**, district petroleum engineer at Brownfield, promoted to assistant division petroleum engineer of the West Texas division with headquarters at Midland; **D. F. Pendley, Jr.**, district petroleum engineer at Electra, promoted to assistant division petroleum engineer of the Oklahoma producing division with headquarters at Oklahoma City; **Robert C. Randle**, district petroleum engineer at Falfurrias, transferred to the Brownfield district as district petroleum engineer; **Joseph E. Morris**, district petroleum engineer at Kilgore, transferred to Drumright; **J. L. White, Jr.**, district petroleum engineer at Shreveport, transferred to Falfurrias as district petroleum engineer; **J. W. W. Whitney, Jr.**, district petroleum engineer at Wewoka, Okla., transferred to Electra, Texas.

Other promotions involve **William G. Sole, Jr.**, petroleum engineer at Alice, Texas, promoted to district petroleum engineer at Kilgore, Texas; **Charles F. Underriner, Jr.**, petroleum engineer at Brownfield, named district petroleum engineer at Shreveport; **Glen W. Barb**, petroleum engineer at Duncan, made district petroleum engineer for the Wewoka, Okla., producing district; **Robert K. James** from petroleum engineer to senior petroleum engineer in Houston; **Fritz W. Schall**, senior petroleum engineer at Midland, transferred to the Gulf Coast division offices at Houston; **Emil C. Pela**, petroleum engineer at Falfurrias, promoted to senior petroleum engineer in the general offices in Dallas; **H. L. McKee**, petroleum engineer at Kermit, promoted to senior petroleum engineer in Dallas; **Jack C. Neale**, petroleum engineer at Snyder, Texas, promoted to senior petroleum engineer in Morgan City, La.; **Harry T. Hunnewell**, petroleum engineer at Electra, transferred to Dallas; **Roy E. Devlin**, transferred from the West Texas drilling tools division to Alice as junior petroleum engineer; **Kenneth L. Klingensmith**, transferred from the West Texas drilling tools division to Duncan, Okla., as junior petroleum engineer; **William H. Leach, Jr.** and **John G. Nelson**, transferred from the West Texas drilling tools division to Electra, Texas, as junior petroleum engineers; and **Donald R. Zaremski**, transferred from the West Texas drilling tools division to Eldorado, Kansas, as junior petroleum engineer.

•

Changes in the Producing Division of Magnolia Petroleum Company are **C. F. Stephenson**, superintendent of the Pegasus producing district in West Texas, promoted to assistant division superintendent of the Oklahoma division with headquarters in Oklahoma City; **Kenneth R. Joynt**, transferred from superintendent of Van-

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**Here is a field-proven way to get more wear out of your subsurface equipment:**

Face it! . . . with Diamond Metal—tough, pure tungsten carbide that has the general properties of diamond.

Tool joints, drill collars, drilling bits, cutting tools, fishing tools, rotary shoes . . . will double and triple their down hole life, for faster operations and greater profits.

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Tough-hard Diamond Metal is recommended for every equipment surface receiving abrasion, stress, shock or impact.

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## A MILE OF OIL!

This compact little pump delivers a barrel of oil per minute at 150 pounds pressure—enough pressure to pump water or oil through more than a mile of 2" pipe.

*Model 6600*

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- Corrosion resistant bronze construction.
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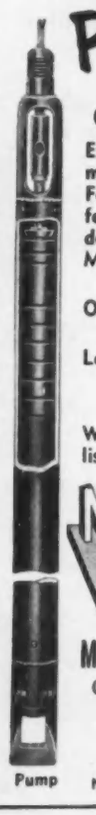

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O.D.—2½, 3, 3½, 4¼, 5, 5½, 7 inches.
Lengths—20, 25, 30 ft.

**Composite Catalog Page 3433**

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Pump Bailer


derbilt producing district to the Pegasus district as district superintendent; **John S. Russell,** from assistant superintendent of the Chase, Kansas, district with headquarters at Kimball, Neb., and transferred to the Vanderbilt producing district as district superintendent; **Clarence T. Taylor,** superintendent of the Alice producing district, moved to the Cushing district, Drumright, Okla., as superintendent; **J. R. Posey,** superintendent of the Cushing producing district, transferred to Alice district as district superintendent; **John C. Fry,** promoted from driller to drilling tools foreman in Gulf Coast drilling tools district and **Aubrey B. Cannon,** promoted from driller to drilling tools foreman in the same area; **William A. Sherman,** promoted from marine drilling tools foreman to marine drilling tools supervisor in the Louisiana-Gulf district; **Forrest B. Farmer,** promoted from assistant production foreman to foreman in Magnolia's Brownfield producing district; **Earl D. Hughes,** from pulling unit operator to assistant foreman in the Brownfield district.

•

Advancements of four Shreveport men have been announced by Union Producing Company, production subsidiary of United Gas Corporation. **D. M. Simmons** was named assistant general superintendent of production; **B. J. Dowd,** named assistant general superintendent of production engineering; **C. H. Clawson,** supervising production engineer for the western division; and **Ben F. Carter,** supervising production engineer for the eastern division. Simmons' promotion was made to fill the vacancy created by the recent promotion of **C. A. McDowell** to general superintendent of production.

•

Cities Service Oil Company has announced the transfer of **Coxey Evans** from the Michigan-Illinois division to Oil Hill as assistant division superintendent for East Kansas to fill the vacancy left by the retirement of **J. P. Murray.** Other transfers include **R. C. Cooper** of Great Bend to Olney, Ill., as assistant division superintendent of production in the Michigan-Illinois division; **J. C. McClure** of Great Bend, formerly assistant to Cooper, assistant division superintendent of production for the West Kansas division; and **O. C. Atkinson** of Great Bend, named division engineer for West Kansas.

•

Humble Oil & Refining Company recently announced the following changes in its Production department personnel: **C. S. Yust,** toolpusher, Lovell Lake District, Gulf Coast Division, promoted to assistant district superintendent of the Winters District, North Texas Division; **C. L. Sparkman,** toolpusher, Potash District, Louisiana Division, transferred to the Athens District, East Texas Division, as toolpusher; **Philip Mantor,** acting assistant chief petroleum engineer in the Petroleum Engineering Division, Houston, has returned to the Southwest Texas Division Office as assistant division petroleum engineer; **C. M. Carothers,** returned to his regular assignment at Stratton as district supervising petroleum engineer after relieving Mantor in the Southwest Texas Division Office as assistant division petroleum engineer.


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WITH magnetic particle inspection by Western Inspection, you can detect minute flaws which cause pipe failures before you start a job. Our new equipment brings a high degree of accuracy to inspection services and a photographic record of the pipe's defects eliminates the chance for mistakes and gives positive, easily understood reports.

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## Better Braking

Replace your worn brake rims with BEMCO Replaceable Rims . . . and find out what *really good braking* and *good service* mean.

BEMCO Brake Rims are made of a special analysis steel with finest heat-treating qualities. Braking surfaces are machined, flame-hardened and ground to provide proper surface tension for smooth feed-off and braking, and to give you longer service from both lining and rim.

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# DEATHS

**Harry Jennings Crawford,** 86, director and chairman of the board of Quaker State Oil Refining Corporation, died November 3 in Oil City Hospital. Crawford was a pioneer in Venango County's oil industry, a financier, industrial leader and philanthropist. He directed his interests from the Emlenton First National Bank where he was president. Crawford was honored at the International Petroleum Exposition in Tulsa last May as a "pioneer of pioneers" in the oil and gas industry.

•

**Francis Thomas Hopp,** 67, of Tulsa, retired secretary and treasurer of the Skelly Oil Company, died November 2 in Tulsa. Hopp joined the Midland Refining Company at Eldorado, Kansas, as treasurer. The firm, owned by W. G. Skelly and associates, was merged into the Skelly company in 1923.

•

**James B. Hoover,** 51, of Tulsa, died August 27. Hoover had been a geologist for Olson Drilling Company for 22 years and more recently was associated as a geologist with O. F. Warren, Tulsa oil producer.

•

**Frank Wood,** 53, vice president of United Supply and Manufacturing Company died September 19 at his home in Tulsa.

•

**Carl Wesley Hedges,** 76, retired superintendent of East Texas District for American Liberty Oil Company of Dallas, Texas, died in Kilgore, Texas, September 30. He retired in 1948 after 17 years service.

•

**Charles W. Grimes,** 77, pioneer Oklahoma oil operator and head of the Grimes Gasoline Company, died October 7 at his home in Tulsa.

•

**Herbert M. Coulson,** 65, of Tulsa, retired assistant general superintendent of the Gas and Gas Production department, Sinclair Oil and Gas Company, died October 16. Coulson joined Sinclair in 1917.

•

**Dale D. Greenwell,** supervisor of mechanical equipment for Great Lakes Pipe Line Company, died October 24 while on a vacation trip at Cassville, Mo. Greenwell, 56, had helped supervise erection and maintenance of Great Lakes pumping equipment and prime movers since 1930. Prior to working for Great Lakes, he had been employed by the Marland and Continental Oil companies in Oklahoma.

•

**Fred B. Koontz** of Tulsa, vice chairman of the board and former president of Mid-Continent Petroleum Corporation, died October 29. Koontz entered the oil business in 1907 as a chemist for the old Waters-Pierce Oil Company at Tampico, Mexico. Five years later he joined Standard Oil Company of California and when Cosden Oil Company was formed in 1917, Koontz resigned from Standard and became process superintendent for the Cosden refinery. He became refinery superintendent in 1922 and was named vice chairman of the board of Mid-Continent which had acquired the Cosden Company in 1949, after serving three years as president.

•

**Allen E. Oak,** 65, of Tulsa, vice president of Griffin Producing Company, died November 2 in a Tulsa hospital. Oak worked for the Echo Oil Company before becoming vice president of the Griffin firm in the 1920's.

•

**William E. Emery,** 56, assistant manager of the Crude Oil Purchasing department of The Carter Oil Company, died October 8 at his home in Tulsa. He had been with Carter for more than 30 years.

•

**Walter G. Ricketts,** 68, of Tulsa, retired general superintendent of the Production department, Amerada Petroleum Corporation, died October 7. He had been with Amerada for more than 30 years and retired in 1950.

•

**L. M. Wilson,** 55, of Katanoah, N. Y., died November 18 in Houston, where he had gone to attend a directors' meeting of Pan-American Petroleum and Transport Company. Wilson was secretary of the firm.


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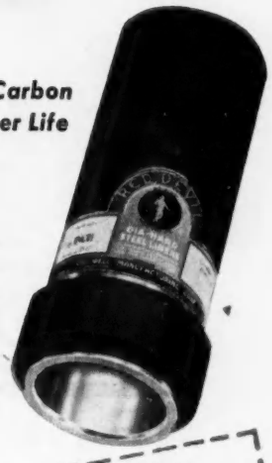
"DIA-HARD" Slush Pump Liners

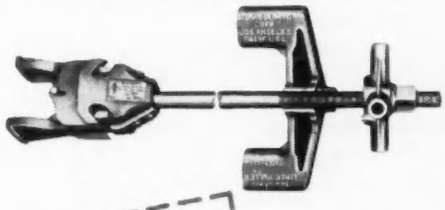
*High Hardness and High Carbon The Combination for Longer Life*



Maximum wear resistance results from the combination of *high hardness* and *high carbon*, not from high hardness alone. The deep wear resistant case of Red Devil "Dia-Hard" liners has a uniform *hardness* of 62-64 Rockwell "C" and a uniform *high carbon* content in excess of 1.00%. This combination of a case of high hardness and abrasive resistant carbides with a core of high tensile strength and ductility is obtainable only by our special "Dia-Hard" process.

Integrally forged liner glands; precision honed bore. Outside dimensions are accurately machined assuring perfect working fits with liner packing assembly and pump cylinder for positive sealing against modern high pressure pump operation.

*Write for Price Catalog No. P-120.*



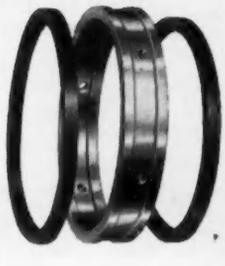
LINER PULLERS

The Red Devil Liner Puller is a strong, heavy duty tool capable of pulling the most obstinate liner. Simple in operation, there are no pins, connecting links or other small parts to bend, shear, break or lose. Two Types: "Universal Type" (as illustrated) for slush pumps, the "Expanding Grip Type" for pulling thin wall tube-type liners in small pumps. *Write for Price Catalog No. P-122.*

TELL-TALE LINER PACKING ASSEMBLIES

**Give warning before pump damage**

Tell-Tale Liner Packing Assembly consists of two "Dia-Tex" oil and heat resistant sealing rings separated by a precision machined corrosion-resistant steel lantern ring. Internal leakage is detected instantly through the tell-tale hole before costly fluid cuts can damage the slush pump. For information on Red Devil Tell-Tale Packing Assembly or "Dia-Tex" Liner Sealing Rings *write for Price Catalog No. P-121.*



***Consult Composite Catalog***

for full information on Red Devil Products or write for price catalogs. Red Devil Products are available through your supply store.

***Oil Well Manufacturing Corp.***

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# Companies in the News

**SAN JUAN EXPLORATION COMPANY** has absorbed by merger Deep Valley Petroleum Company, Inc., and Bradley Oil Company, in an expansion move which will increase the total capitalization and scope of operations of the San Juan group of companies. Robert J. Bradley, president of the successor corporation, states that the merger is one of a series intended to bring all the various activities under one ownership. This includes the management of 400 oil and gas wells in the Mid-Continent area, the operation of the consulting firm, Bradley Oliver and Associates, and either directly or through wholly-owned subsidiaries, the outright ownership of approximately 150 oil wells in Texas, Oklahoma, Kansas, Mississippi and Canada.

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NONCORROSIVE*• NONPOISONOUS
*To Ferrous Metals
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Removal of weeds and grasses need not be a costly problem! Borascu, when properly applied, will destroy weeds and grasses with its effective root-action; yet it is safe, inexpensive and easy to use. Removing undesirable vegetation by old-fashioned methods such as hoeing monthly, or quarterly, is an extravagant waste of manpower and money. Be thrifty ...use Borascu; a single application may keep an area cleared for 18 to 24 months!

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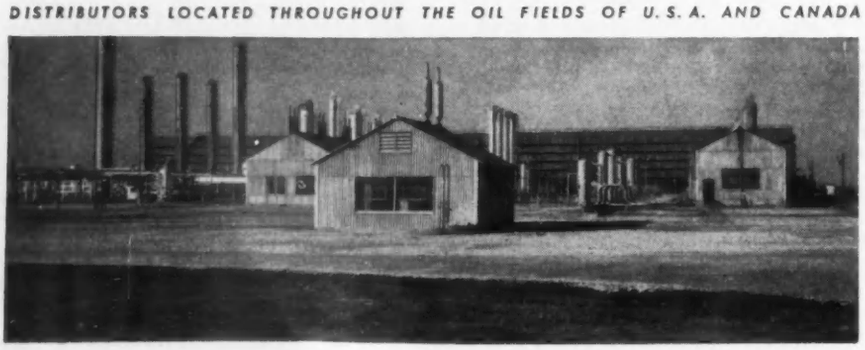



**SAN JUAN OIL COMPANY** has acquired virtually all the stock of Mazda Oil Corporation from National Phoenix Industries, Inc. San Juan has been managing the Mazda properties for the past 1½ years for the account of National Phoenix and will continue to operate Mazda as a wholly owned subsidiary of San Juan Oil Company. The transaction involving in excess of two million dollars, includes 106 producing wells in Kansas, Oklahoma and Texas, with a daily production of approximately 800 net barrels per day.

•

**CALIFORNIA TEXAS OIL COMPANY LIMITED** has completed a move to new quarters at 380 Madison Avenue, New York. The move brings the varied activities of Caltex together from five different buildings. Contrasted with its New York staff of 440 at the end of World War II, Caltex now has 1225 employes. Operations of the Caltex group are all overseas in more than 60 countries of the Eastern Hemisphere. The new offices are on six floors of the building, from the eighth to the thirteenth.

•

**OIL AND GAS PROPERTY MANAGEMENT, INC.**, Dallas, announces the purchase from A. W. Cherry, Dallas, of certain producing oil interests in Indiana, Illinois and Montana.

•

**ARROW DRILLING COMPANY** announces the reactivation of its operations in the Rocky Mountain area and has appointed James Parker as division manager of both drilling and production. Parker has been with Arrow since 1938, except for a period during World War II. Parker will reside in Denver and his headquarters will be in Arrow's office in the Continental Oil Building.

•

**STANWELL OIL AND GAS LIMITED** has acquired all interests held by Blair Oil and Gas Corporation in Texas, Alabama, Mississippi, Georgia and Montana.

•

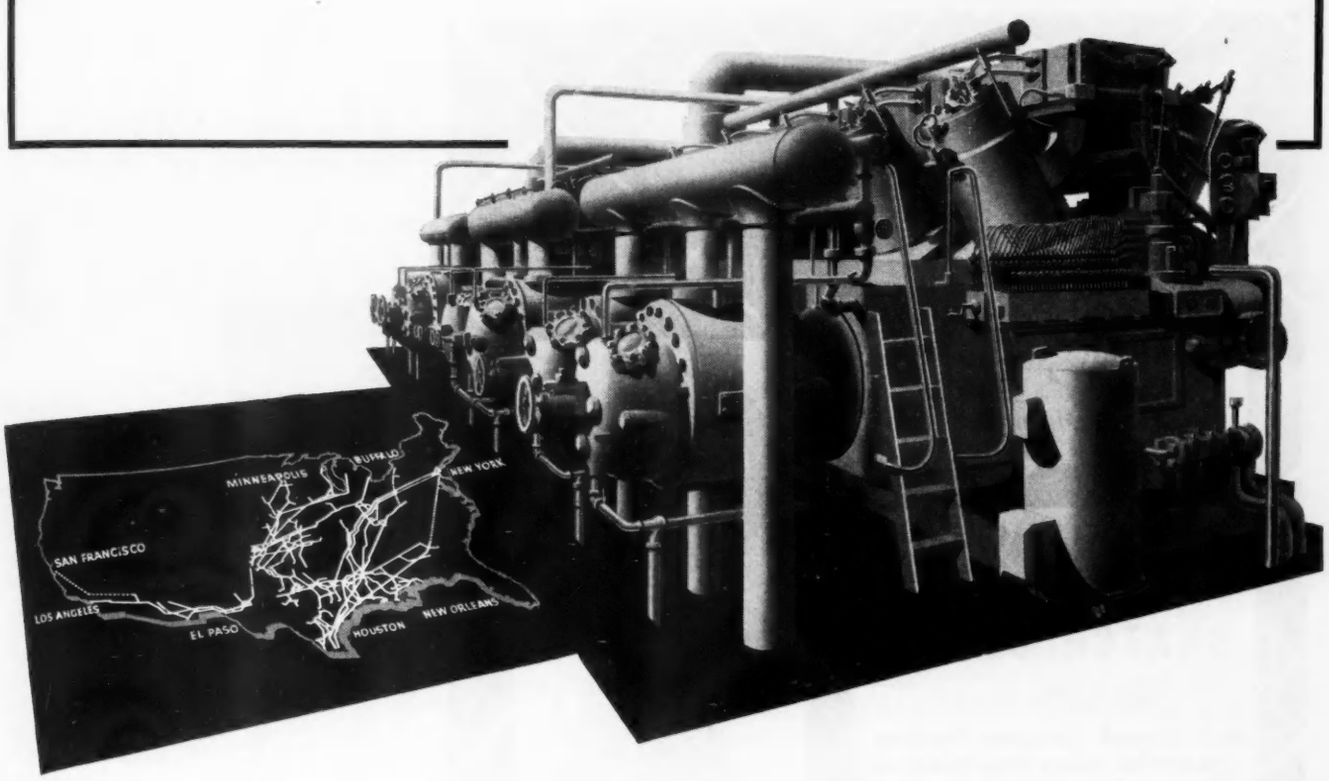
**NORTHERN NATURAL GAS PRODUCING COMPANY** has opened a new district office in Denver in the Railway Exchange Building. This office will supervise gas and oil exploratory activity in Colorado, Wyoming, western Nebraska and northwestern New Mexico. Earl E. Marshall is district geologist in charge of the Denver office.

•

**DEEP ROCK OIL CORPORATION** will shift its area office in the Williston Basin from Bismark, N.D., to Billings, Mont. John C. Meyer will continue as area geologist and Harry W. Hitt will continue as area landman. Douglas N. Moody will be senior landman. The office is one of three under the managership of R. B. Hurlbutt.

# GULF SECURITY OIL

provides better lubrication
for pipe line compressor units,
helps prevent operating troubles




Here's the lubricant you can depend on to help keep your pumping stations operating smoothly and continuously—Gulf Security Oil. It provides effective protection for cylinders and bearings in both engines and compressors.

Because of its excellent resistance to oxidation, Gulf Security Oil stands up for many hundreds of hours without any appreciable change in its original properties. After years of operation with this quality lubricant, equipment shows remarkable freedom from cylinder wear and a minimum of carbon deposits on valves and rings. And because oil control rings are kept clean, oil consumption is remarkably low.

Operators of the many units lubricated with Gulf Security Oil report that this quality lubricant helps them get more operating hours between overhauls, and avoid unscheduled shutdowns.

For additional information on Gulf Security Oil and for the services of a Gulf Sales Engineer, get in touch with your nearest Gulf office today. Write, wire, or phone.

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GULF INDUSTRIAL LUBRICATION

# What's Happening

## AMONG INDUSTRY ASSOCIATIONS

### Desk and Derrick Elects Officers in San Francisco

New officers for 1954 were recently elected and installed by the Desk and Derrick Club of San Francisco. They include Mary Emrick, Standard Oil Company of California, president; Marnie Douglas, Tide Water Associated Oil Company, first vice president; Virginia Rogers, Shell Chemical Corporation, second vice president; Barbara Sage, Honolulu Oil Corporation, treasurer; Aurie Berto, Bishop Oil Company, recording secretary; Lucy Johnson, Ethyl Corporation, corresponding secretary; and Ruth Mulchay, Shell Oil Company, director for two year term.

Officers whose terms are held over from 1953 are Rae Hasfjord, Tide Water Associated Oil Company, junior past president and director; and Lee Davis, American Independent Oil Company, director for one-year term.

John G. Pew

Frank M. Porter

### Spencer Heads API Board; Honorary Members Named

P. C. Spencer, president of Sinclair Oil Corporation, New York, was elected chairman of the board of directors of the API during the thirty-third annual meeting in Chicago early in November.

P. C. Spencer

Other officers for 1954 are Frank M. Porter, president of Fain-Porter Drilling Company, Oklahoma City, president; John G. Pew, Sun Oil Company, Philadelphia, vice president—production; John W. Newton, Magnolia Petroleum Company, Beaumont, vice president—refining; R. M. Bartlett, Gulf Oil Corporation, Pittsburgh, vice president—marketing; C. S. Jones, Richfield Oil Corporation, Los Angeles, vice president—transportation; B. B. Jennings, Socony-Vacuum Oil Company, Inc., New York, treasurer; Lacey Walker, API, New York, secretary-assistant treasurer.

Eleven prominent oil men were made honorary members of the board, the first time honorary membership has been designated. These are men who have retired from the API board after 10 years or more of service. They include H. D. Collier, Standard Oil Company of California, San Francisco; J. Frank Drake, Gulf Oil Corporation, Pittsburgh; Wirt Franklin, Oklahoma City; Alexander Fraser, Shell Oil Company, New York; H. T. Klein, The Texas Company, New York; J. Howard Pew, Sun Oil Company, Philadelphia; W. S. S. Rodgers, The Texas Company, New York; W. C. Teagle, Standard Oil Company (New Jersey), New York; O. D. Donnell, The Ohio Oil Company, Findlay, Ohio; Robert H. Colley, The Atlantic Refining Company, Philadelphia; and John R. Suman, Standard Oil Company (New Jersey), New York.

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★ Patented opening feature permits easy insertion of line while block is suspended.
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*How a military aircraft problem led to*

# The Greatest Gasoline Development in 31 Years

**TCP* is a revolutionary new gasoline additive that stops the greatest cause of power loss in modern automobile engines. TCP additive is now blended into Shell Premium, and is available at Shell stations throughout the United States.**

With the advent of high octane number fuels for peak performance of both military and civil aircraft, the problem of spark plug fouling became critical. Maximum design performance and range of the aircraft were severely limited by deposits formed on the insulating portions of the spark plugs. These deposits caused malfunctioning of the spark plug often at critical times when maximum spark plug performance was necessary. The problem was studied jointly by petroleum suppliers, engine and spark plug manufacturers, and airframe builders both from the chemical and mechanical standpoint.

### Shell Research Mobilized

To tackle the problem Shell mobilized its research facilities. First step was development of a dependable test for spark plug fouling. With this test, Shell had the necessary equipment with which hundreds of compounds could be quickly tested—rejected and tested again in different formulations. Round-the-clock testing finally led to the discovery of Shell's TCP additive.

*Not since the introduction of tetraethyl lead in 1922 has there been such an important development in gasoline.*

### How TCP additive helps existing engines—can lead to even better designs

This remarkable ingredient actually changes the nature of combustion deposits inside an engine; actually makes them harmless. Plug-shorting and pre-ignition are eliminated. Now car owners get up to 15% more power—often before using the second tankful. Spark plug life is increased as much as 150%, and gasoline mileage is improved.

Car manufacturers and dealers benefit too! New cars perform the way designers intended; new car buyers have few performance complaints. And for the future, designers can plan for higher compression and horsepower, lighter and more compact engine designs.

**TCP is Shell's trademark for this additive. It is another example of the progressive research that goes forward day and night in Shell laboratories. It is evidence again that Shell research provides more and better products from petroleum.**

*Patent applied for

**SHELL OIL COMPANY**

SHELL

**AIME Petroleum Branch Elects Officers**

Heading the activities of the AIME Petroleum Branch this year and next are, left to right, Basil Kantzer, Union Oil of California, Los Angeles, 1953 vice chairman; John P. Hammond, Amerada Petroleum Corporation, Tulsa, 1953 vice chairman; Tom C. Frick, The Atlantic Refining Company, Corpus Christi, Texas, 1954 vice chairman; John R. McMillan, Fullerton Oil Company, Pasadena, Calif., 1954 chairman-elect; Claude R. Hocott, Humble Oil & Refining Company, Houston, 1953 chairman; and Joe B. Alford, executive secretary, AIME Petroleum Branch, Dallas.

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RECORDING CONTROLLING*
LIQUID GRAVITOMETER
CONTROLS BLENDING OF TWO OR MORE FINISHED PRODUCTS
. . . for Pipelines, Refineries, Chemical Plants, etc.
This new instrument serves to determine and record the specific gravity of liquids in the same manner as the standard Arcco-Anubis liquid gravitometer.
*In addition to these features, a controlling mechanism is provided, which may be pre-set to operate the pipe line, refinery, still and plant control valves to any specific gravity range required in blending two or more finished products.
Temperature corrected, this extremely accurate instrument is adaptable to high pressures and is available with internal parts of stainless steel for use with corrosive liquids. Send for bulletin No. 111 A.
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## ASME Petroleum Division Announces New Officers

O. L. Lewis, C. F. Braun Co., was named chairman and P. E. Frank of Sinclair, N. Y. was named vice chairman of the executive committee of the ASME Petroleum Division at the meeting held in Houston September 28-30. Members of the committee are M. A. Scheil, A. O. Smith Co., A. H. Newberg, Service Pipe Line Company; and Jack S. Rearick, The M. W. Kellogg Co.

E. N. Kemler was named research secretary and chairman of the advisory board. Operating committees and personnel include the following:

Transportation—F. O. Stivers, Humble Pipe Line Co., chairman; C. H. Burnham, Panhandle Eastern Pipe Line Co., vice chairman; and F. A. Sleif, Platte Pipe Line Co., Delbert Jones, Gulf Pipe Line Company; and T. D. Williamson, Tulsa.

Production—H. H. Meredith, Humble Oil & Refining Co., chairman; and W. P. Binger, Shell Oil Corporation, vice chairman.

Refining—J. P. Mooney, Humble Oil & Refining Co., chairman; H. H. Evans, Sinclair Oil Corporation, vice chairman; and W. A. Sullanden, Pan American Refining Corporation; R. A. Harang, The M. W. Kellogg Company; and R. W. Mecklin, Standard Oil Company of Indiana.

Materials—F. K. Zerbe, A. O. Smith Co., chairman; A. C. Bidwell, Esso Standard Oil Company, vice chairman; E. G. Newton, Atlantic Refining Company; A. G. Backow, Texas-Illinois Pipeline Company, and G. E. Nevill, Cameron Iron Works.

Manufacturing—Allen F. Rhodes, McEvoy Company, chairman; A. A. Hardy, W. C. Morris Manufacturing Inc., vice chairman.

G. L. Farrar of The Oil and Gas Journal is press chairman.

## AIME Petroleum Branch Has Peak Attendance

Approximately 2000 registrants were numbered in the largest annual attendance of the American Institute of Mining and Metallurgical Engineers Petroleum Branch fall meeting held in Dallas October 19-21 with the Dallas local section as hosts.

About 45 technical papers were presented during the three-day program.

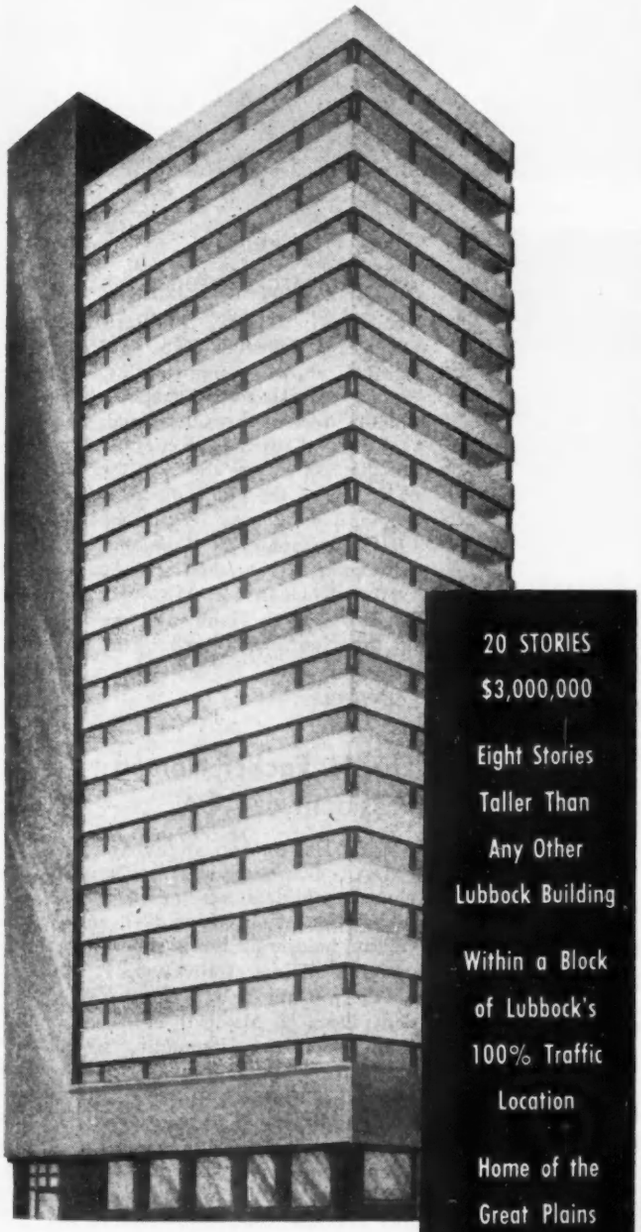
The schedule of future AIME Petroleum Branch fall meetings has been set as follows: 1954—Plaza Hotel, San Antonio, Oct. 17-20; 1955—Roosevelt Hotel, New Orleans, October 2-5; 1956—Biltmore Hotel, Los Angeles, Oct. 15-19.

## AAPG, SEG, SEPM Groups Name Officers

Results of election of new officers for 1954 for the Pacific Section, American Association of Petroleum Geologists, and the Pacific Coast Sections of the Society of Exploration Geophysicists and Society of Economic Paleontologists and Mineralogists were announced during the thirtieth annual joint meeting in Los Angeles November 5-6.

AAPG officers include Harold Rader, Standard Oil Company of California, Los Angeles, president; A. Theodore Lee, Sunray Oil Corporation, Los Angeles, vice president; and George H. Feister, Union

# Modern Lubbock Office Space Available July, 1954


20 STORIES
$3,000,000
Eight Stories Taller Than Any Other Lubbock Building
Within a Block of Lubbock's 100% Traffic Location
Home of the Great Plains Life Insurance Company

Construction of the ultra-modern Great Plains Building is on schedule. If you act now, interior decoration and space division can be done to your specifications.

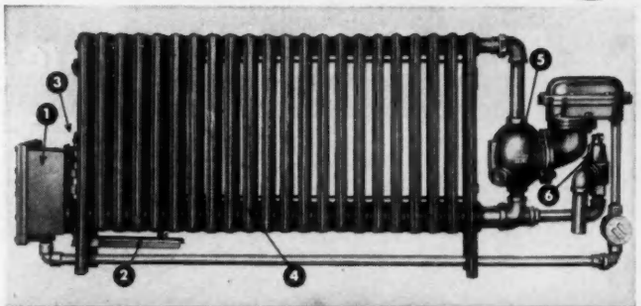
## GREAT PLAINS LIFE BUILDING

Standing TALL On the Texas Plains

# NOW YOU CAN HAVE SAFE HEAT for COMBUSTIBLE ATMOSPHERES

*Listed by Underwriters' Laboratories, Inc. for Class 1-Group C & D; Class 2-Group E, F and G Atmospheres.*

**Underwriter Approved**



## The BURNHAM EXPLOSION-PROOF ELECTRIC RADIATOR

If you have hard-to-heat places in your plant where explosive or combustible atmospheres are a continual hazard you need this proven Burnham EXPLOSION PROOF RADIATOR. It's a compact, self-contained plant which turns *electric current* into *heat!* It's built by heating experts who know how, (80 years of experience and research). It is fully automatic and cannot touch off an explosion even though continually surrounded by explosive gases or dusts. Its complete safety is attested by approval of The Underwriters' Laboratories and the Canadian Standards Association. Quickly installed anywhere. An economical solution to hazardous and difficult heating problems. 110V, 220V or 440V. 6,720 to 10,080 B.T.U. capacities.

### Check the 6 Points Numbered Above

1. Electric controls completely inclosed in gas tight cast-iron box.
2. Surface temperature of radiator automatically controlled.
3. Pressure Control—automatically cuts current should pressure reach 15 lbs. p.s.i.
4. Immersion type heating unit—the finest element made. It is always completely immersed in water.
5. Low water cut off—current automatically cut if water level falls below float.
6. Relief valve—operates automatically should pressure exceed 30 lbs. p.s.i.

*Burnham Corporation*

Electric Radiator Dept.

**Zanesville, Ohio • Irvington, N. Y.**

All radiators shipped with anti-freeze

**MAIL HANDY COUPON TODAY** for full information

**Burnham Corporation** WO-123
**Zanesville, Ohio**
Please send illustrated folder giving full information about the Burnham Explosion-Proof Radiator.

Name .....
Address .....
City ..... State .....

Oil Company, Los Angeles, secretary.

Officers of the SEG are Joe B. Hudson, Humble Oil & Refining Company, Los Angeles, president; Hal C. Bemis, Standard Oil Company, Los Angeles, vice president—southern district; Robert J. Wells, Richfield Oil Corporation, Bakersfield, Calif., vice president—northern district; and F. F. Lambrecht, The Texas Company, Los Angeles, secretary-treasurer.

John Ruth, Standard Oil Company, Los Angeles, is president of SEPM, and Wayne Elliott, Richfield Oil Corporation, Long Beach, is secretary-treasurer.

# The S. D. DAY Company

## Serving the Oil and Gas Industry

Pictured here are some typical applications of coating and wrapping products distributed by S. D. Day Company.

*National Distributor*

**THE RUBEROID COMPANY***
**Pipe Line Asbestos Felt**

*Gulf Coast Distributor*

**PITTSBURGH COKE & CHEMICAL CO.***

**Hot Applied Coal Tar Enamels for Pipe Lines**

**Cold Applied Coal Tar Coatings for General Industry**

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**AMERICAN COATING & SUPPLY CO.**
**Field Jointer**

Write, wire or telephone for literature, prices and engineering counsel.

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## OIIC Chairmen Are Congratulated

Manley F. Ousley, Phillips Petroleum Company, Omaha, Neb., second from right, is shown congratulating Morse C. Palmer, Standard Oil Company (Indiana), Omaha, second from left, and Robert E. Osborn, Sinclair Refining Company, Omaha, center, as the new Nebraska co-chairmen of the Oil Industry Information Committee. Ousley is former Nebraska OIIC chairman. E. Dale Smart, Skelly Oil Company, Omaha, left, is past district OIIC chairman for Missouri, Iowa and Nebraska. Herb Hahn, executive secretary of the Nebraska Petroleum Marketers, Lincoln, right, is Nebraska OIIC vice chairman.

## Earl H. Eacker Named President of AGA

Earl H. Eacker, president, Boston (Mass.) Consolidated Gas Company, was named president of the American Gas Association at the thirty-fifth annual convention held in St. Louis.

Other officers elected were F. M. Banks, Southern California Gas, first vice president; Dean H. Mitchell, Northern Indiana Public Service, Hammond, second vice president; and Vincent T. Miles, Long Island Lighting Company, treasurer.

In addition, 14 directors of the AGA were named during the meeting which was attended by more than 500 delegates representing gas utility and pipe line companies and gas appliance manufacturers.

## Wildcat Christmas Hi-Jinks To Be Held December 15

To provide accomodations for more oilmen, the annual Wildcat Christmas Hi-Jinks of the Western Oil and Gas Association this year will be held at the Hollywood Palladium, 6215 Sunset Boulevard, Hollywood, on December 15.

"Wildcats Look Backward," a skit depicting the early days of the oil industry in California, as well as professional variety entertainment are included on the program.

Reservations for the affair, which will start at 7 p.m., may be made at the offices of the Western Oil and Gas Association, 510 West Sixth Street, Los Angeles.

# What's Happening

## AMONG SERVICE AND SUPPLY MEN

John C. Stokes

John H. Teer

### Reed Roller Bit Salesmen Retire from Active Service

Three Reed Roller Bit Company veterans, each with a career in the oil tool industry, retired from active service November 1. They are salesmen John H. Teer of Houston and Frank C. Sergeant of Corpus Christi, Texas, and John C. Stokes, development engineer at Houston headquarters.

Teer figured prominently in the management of the Mack Manufacturing Company, plant site of which was taken over by Reed early in its history. Later he joined another company, but returned to the Reed scene in 1946 in a sales representative capacity.

Sergeant has been associated with Reed for almost 25 years. He began work in 1929 as a sales serviceman in Louisiana, and in 1935 went to the company's South Texas sales area. Since 1947 he has been in special sales work there.

Stokes, development engineer, had more than 50 years experience in engineering and allied work behind him. Stokes is credited with numerous company owned and used patents.

### Caskey Elected Vice President Of United States Rubber

John E. Caskey has been elected a vice president of United States Rubber Company and general manager of the company's Naugatuck Chemical division.

Caskey succeeds John P. Coe, vice president, who will handle the company's interests in the transfer of synthetic rubber plants from the government to private industry.

George R. Vila, formerly general sales manager of Naugatuck Chemical division, will become assistant general manager of the division.

Caskey, together with Vila, will direct all sales, research and production activities of Naugatuck Chemical division which has chemical plants in Naugatuck, Conn.; Los Angeles, Calif.; Painesville, Ohio; and Baton Rouge, La.; operates two synthetic rubber plants for the government in Naugatuck, Conn., and Port Neches, Texas, and the Kankakee Unit of Joliet Arsenal, Joliet, Ill., manufacturing high explosives for the armed forces.

### Borg-Warner Announces Election of Gehlbach

Election of H. Hunter Gehlbach as an assistant secretary of Borg-Warner has been announced. Gehlbach also retains the title of assistant general counsel which he first assumed in 1949. He joined the Borg-Warner Legal department in 1943.

Gehlbach received his law degree at the University of Iowa in 1936. He became a partner of Wood, McNeal and Gehlbach in Moline in 1937.

*Now available in quantity production*

Here is a high molybdenum silicon alloy steel drilling bit that will cut its way through the hardest formations faster, at less cost per foot, and with fewer dressings, than the conventional carbon steel bit used in ordinary drilling practice. The SPANG MOLLOY BIT is a *special* alloy bit, completely heat treated, with higher strength in the blade section and greater pin strength. Because of its deep penetrating hardness, it resists abrasion and battering under the severest drilling conditions. Its use is recommended where ordinary bits are ineffective.

Unlike most high alloy bits, SPANG MOLLOY BITS can be field dressed and tempered by following practices similar to those for carbon steel bits.

When you encounter formations that slow you down and skyrocket costs, ask your Dealer for SPANG MOLLOY BITS—"The Red Bit with the Yellow Collar."

For complete information on MOLLOY BITS and FREE CATALOG of other SPANG CABLE TOOLS, consult your nearest SPANG DEALER or write direct to:

**SPANG & COMPANY**

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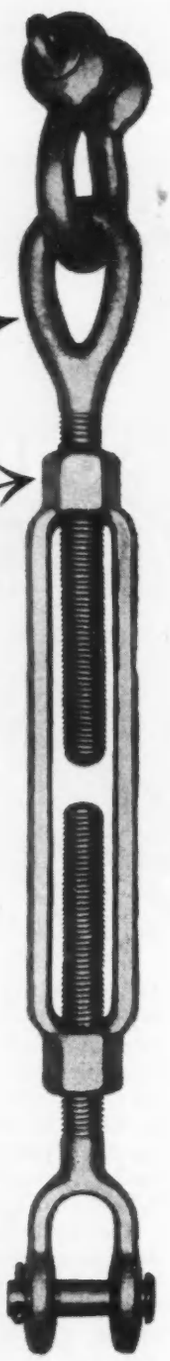
For over 60 years Manufacturers of Spang Weldless Jars and a Complete Line of Cable System Drilling and Fishing Tools for Oil and Gas Wells, Water Wells, Prospect Drilling and Shot Blast Holes.

# IMPROVED TURNBUCKLES

have

NEW EYE DESIGN

HEX ENDS



Laughlin's exclusive pear shaped turnbuckle eyes were desiqned to eliminate need for special shapes. It's the only eye that will take the ear of a shackle one size smaller than the turnbuckle. The shape makes it stronger than a round eye. It looks better and works better. The next time you need turnbuckles order Laughlin and see for yourself.

All Laughlin turnbuckles have hexagon ends and rugged reins. Easily adjusted with a wrench. Wheelabrated finish dipped in a rust preventive or hot dip galvanized.

**FOR SAFETY'S SAKE SAY**

**LAUGHLIN**

*The Full Line of Wire Rope & Chain Fittings*

THE THOMAS LAUGHLIN CO., 1213 Fore St., Portland, Me.


## Tipsword Heads District For Rector Well Equipment

Wallace R. Tipsword, a sales representative for Rector Well Equipment Company since February, 1952, has been placed in charge of the company's Kansas - Oklahoma District, with headquarters in Tulsa.

Tipsword has been in Oklahoma City until his recent transfer. Before joining the company, Tipsword was West Texas sales representative for a pump company. He is a graduate of Tulsa University.

Wallace Tipsword

## Oilwell Supply Division Announces Promotion of Link

Fred E. Link, assistant to the president of U. S. Steel's Oil Well Supply Division, has been appointed director — facilities planning.

In his new position, Link will be in charge of general administration of the facilities planning policies of the division. His responsibilities will be concerned with the planning of new construction; installation, repair and replacement of buildings and machine tool facilities; letting of contracts for new construction and alterations and for property and equipment; and recommendations and approvals concerning appropriations for facilities and tools.

As assistant to the president since January 1, 1950, Link has been engaged primarily in the study and development of improvement programs in "Oilwell" facilities across the United States and in Canada. He will continue to headquarter at the division's home offices in Dallas.

## Geophysical Service Appoints Ellsworth to Sales Manager

Geophysical Service, Inc., has announced appointment of T. P. Ellsworth, formerly division manager of its West Coast division, as sales manager in the GSI Marketing department.

Ellsworth has moved from Bakersfield, Calif., to Dallas, where he will work from the general headquarters of GSI, 5900 Lemmon Avenue.

A graduate of Yale University, Ellsworth was a party chief with Western Geophysical Company from 1936 to 1943. He was chief geophysicist with Richfield Oil Corporation from 1943 to 1951. In 1951 he joined the staff of Geophysical Service, Inc., as division manager, West Coast division.

## Foster Elected Treasurer Of Air Reduction Company

Howard H. Foster has been elected treasurer of Air Reduction Company, Inc. Foster succeeds William Winters, Jr., who retired. Winters, who has been with the company for over 35 years and has been its treasurer since 1948, is retiring under the company's retirement income plan.

Foster joined Air Reduction in 1933 and has served in various sales and management positions. In 1946 he was appointed manager of business relations. He was elected assistant treasurer of the corporation in February of this year.

## The E-C Inclinometer gives you

# MORE of a RUN for your MONEY

### than *Any Other* straight hole instrument

### *When You Run a Sperry-Sun E-C...*

1. You know positively that the instrument was at rest when the record was made, otherwise the disc will show no reading.
2. You know positively— that the reading is accurate because you can run a simple double check in a few minutes by raising the instrument several feet and lowering it again to the recording depth for another reading.
3. And you can measure positively — the inclination of the hole at several points, if required, by taking several readings on one trip. The E-C is the *only* straight hole instrument with which multiple records may be taken on a single run.

• E-C rental rates are reasonable — you do not pay a premium rate for premium performance. Rent an E-C and keep it on the rig until the last foot of hole is made. It will give you more information with less cost, less work and less trouble than any other straight hole instrument. Contact the Sperry-Sun office nearest your location.

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MULTIPLE OFFICES mean BETTER SERVICE

EXPERIENCE means BETTER PIPE LINES

NORTH AMERICA
EDMONTON
TORONTO
TULSA
MINNEAPOLIS
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WASHINGTON
ATLANTA
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## WILLIAMS BROTHERS

ENGINEERS
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OIL • GAS • PRODUCTS • WATER
PIPELINES AND PUMPING STATIONS

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## Tool Pushers Prefer JOHN CRANE PLS*

*PLASTIC LEAD SEAL

FOR CASINGS, DRILL COLLARS, BIT JOINTS, CHRISTMAS TREES AND OTHER THREADED CONNECTIONS

"John Crane" Plastic Lead Seal is the Petroleum Industry's favorite all-purpose joint and thread compound. Easily applied – insoluble in *all* petroleum products – PLS never hardens – won't crack due to temperature changes – gives lasting protection against gall and rust. Leakproof connections are assured – even under abnormally high operating pressures. Joints may be easily broken after years of service. Available in 1, 5, 14 and 28-lb. pails. See your local oil field supply store.

**Test-prove PLS at *our* expense**
**Send today for generous free sample**

**Crane Packing Company,**
**1817 Cuyler Avenue, Chicago 13, Ill.**

JOHN CRANE CRANE PACKING COMPANY

## Continental Supply Names Davis Manager - Tubular Sales

Jack A. Davis, who has for the past seven and one-half years been manager of The Continental Supply Company's Pipe Line Equipment Division, has been named manager, tubular sales, for the company's Oklahoma-Kansas Division, with headquarters in Tulsa, Okla.

R. E. (Dick) Scheibel, former refinery salesman in Lake Charles, La. has been appointed to take over Davis' former position in the Dallas, Texas, home office of the company.

Davis joined Continental 20 years ago and before moving to the Dallas office had served as a field salesman in East Texas and later as a city salesman in Fort Worth.

R. E. Scheibel

Jack A. Davis

A native of Snyder, Texas, he holds a bachelor of science degree in civil engineering from Southern Methodist University.

Scheibel has been with Continental since August, 1946. In addition to refinery salesman, his other positions with the company include that of store manager in both Lake Charles and Eunice, La.

## Edward Valves Transfers H. W. Bierman to Tulsa

H. W. Bierman has been appointed sales engineer for Edward Valves, Inc., for the territory comprising the state of Oklahoma and parts of Missouri, Kansas, Arkansas and Texas.

H. W. Bierman

Bierman, formerly located at the home office, will make his headquarters at the Rockwell Manufacturing Company offices in Tulsa. Edward Valves, Inc., subsidiary of Rockwell, markets a line of cast and forged steel valves for petroleum, power plant and other industrial and technological services.

## Continuous Weld Pipe Production Started at National Tube

Production of continuous weld pipe has started at the Fairless Works of National Tube. Initial operation at this United States Steel Division plant was attained with the rolling of 1½-inch diameter pipe on the first of two continuous weld mills. The skelp mill which produces products for pipe manufacture and certain finishing facilities are also in operation.

Facilities at National Tube include a skelp mill, two continuous weld mills for producing pipe from one-half-inch to four inches in diameter, galvanizing and finishing departments and a 30,000-ton capacity warehouse. The National Tube plant has an annual capacity of 281,000 tons of pipe.

## Blake Is Works Manager At A. O. Smith Plant

Peter S. Blake, formerly factory manager of the Truck Frame Division at Milwaukee, has been appointed works manager of A. O. Smith Corp.'s new automotive frame plant now under construction at Granite City, Ill.

The $5,000,000 plant, which will make fully-assembled passenger car frames for Chevrolet, is expected to be ready for initial production by early summer of 1954. Blake formerly was with Carnegie-Illinois Steel Co., joining A. O. Smith in 1947.

## Nicoli Names Superintendent Of CF&I Wire Mill at Buffalo

V. L. Nicoli has been appointed superintendent of the wire mill at the Buffalo, N. Y., plant of The Colorado Fuel and Iron Corporation's Wickwire Spencer Steel Division.

Nicoli was formerly assistant superintendent of the wire mill. He joined the Buffalo plant's management staff in 1950, transferring from the South San Francisco Works of the California Wire Cloth Corporation, a division of Colorado Fuel and Iron.

L. P. McNamara, formerly wire mill general foreman at the Buffalo plant, has been named assistant superintendent of the wire mill.

The Wire Mill department of CF&I's Buffalo plant is currently undergoing a modernization of facilities for producing hard drawn spring wire. With the installation of new wire drawing machines, ex-

*oil field slang for corrosion and rust

**Have your pipe lined with TK-2 and forget about down time and replacement costs due to paraffin, corrosion (or the legendary pipeworm). Proved by more than 7 million feet in service, TK-2 prevents paraffin accumulation and resists attack by sour crude, gas condensate, and many corrosive fluids.**

**TK-2 is a baked-on plastic, specially compounded from phenol formaldehyde resin, which Tube-Kote experts apply to pipe, sucker rods, and tubular equipment. For wells on packer, isolated or offshore wells, wells with storm chokes, or other tough spots where ordinary corrosion and paraffin preventives fail, specify TK-2 and your troubles end.**

**WRITE TODAY FOR THIS DATA BOOKLET**
**which tells all about TK-2. It gives case histories, chemical data, and describes method of applying. Or see page 4979 in your Composite Catalog.**

**TUBE-KOTE, INC.**
P. O. Box 20037
Houston 25, Texas

TUBE-KOTE
*First Name In Corrosion Resistance*

TUBE-KOTE T.M. Reg

pected to be in operation by the end of this month, the plant's production of this type of spring wire for the automotive, mechanical, bedding and furniture spring industries will be raised by an estimated 12,000 tons annually.

## August Named District Manager Of Republic Supply Company

Alex L. August has been appointed district manager of the Shreveport District of Republic Supply Company. He succeeds W. M. Haynes who has resigned.

Alex L. August

August joined Republic Supply at Corpus Christi in 1949 having previously been associated with oil field equipment companies both in the United States and South America. He received his degree in Mechanical Engineering from the University of Texas and was affiliated for ten years with another supply company. He has also served for four years as purchasing agent with a major oil company in Venezuela.

## Rockwell Sales Engineers Complete Gas Courses

Two Rockwell Manufacturing Company sales engineers recently completed courses in natural gas transmission and distribution at the Institute of Gas Technology, Chicago, Ill., in line with the company's expanding sales education program. They are Harry J. Schneider of the firms New York district office and Harry Moore of the Columbus, Ohio, office.

Rockwell was the only equipment manufacturer represented at the six-week series' of refresher courses conducted by the Institute to familiarize gas engineers with current industry problems and practices.

## Associated Equipment Names New Service Representatives

J. Daviss Collett, president of the newly organized Houston firm of Associated Equipment, Inc., announced the appointment this week of sales and service representatives for the company's new sonic fluid level recorder.

Bill Harmon, owner of Diamond Coring Service, will cover Illinois from the town of Carmi. In Canada the firm has appointed Bennett & Burns in Regina, Saskatchewan, while Chemical and Geological Laboratories, Inc., were appointed to cover the Rocky Mountain area.

## Leschen Wire Rope Names Dow Chicago District Sales Manager

G. N. Dow has been appointed Chicago district sales manager, Leschen Wire Rope Division, H. K. Porter Company, Inc., St. Louis.

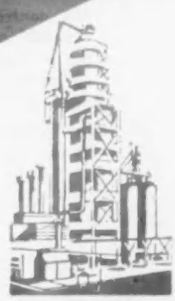
Until his present promotion Mr. Dow had been district representative for Leschen in Detroit.

The Chicago sales district includes Northern Illinois, Iowa, Wisconsin, Northern Indiana, Michigan and Minnesota.

CATAWISSA
DOUBLE UNION SWING CHECK VALVE
"502"

FULL OPENING FOR 100% UNOBSTRUCTED FLOW!

COMPACT!
EFFICIENT!
ECONOMICAL!
EASILY ACCESSIBLE!



*flow line and pipe line type for general oil country use in either horizontal or vertical position!*

CATAWISSA Double Union Swing Check Valves are designed and recommended for the rough and ready demands of oil country applications in lines where no stop is installed close to the check valve and where pipe cleaning mechanisms (go-devils) are used. They are FULL OPENING, furnished with Catawissa PERFECT SEAL Unions on both ends to permit breaking the line at inlet end, with check holding line contents. Union connection on both ends eliminates the use of a full union and nipple necessary to install regular type check valves.

REFAX METAL BODIES
NITENSILOY WORKING PARTS
★
500-lbs. SERVICE O.W.G.
1500-lbs. TEST
250-psi WSP
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SIZES 2" to 6"

SEE OUR CATALOG IN THE COMPOSITE CATALOG

AVAILABLE THROUGHOUT THE OIL FIELDS AT LEADING SUPPLY STORES

WRITE FOR A FREE COPY OF NEW CATALOG 11

CATAWISSA VALVE & FITTINGS COMPANY
60 MILL STREET ★ CATAWISSA, PENNA.

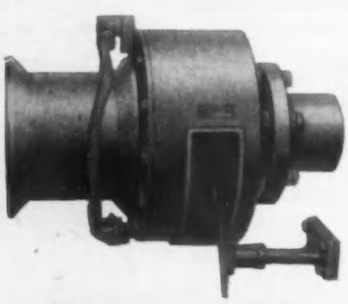
with Foster
AIR CONTROLLED
CATHEADS

The specially developed air control valve assures full and accurate control of the catheads through their full range of speed and line pull. It duplicates the type of control normally exerted by the operator with the regular control lever, but without the manual effort.

The control lever delivers from zero to 40 lbs. pressure during the first 60° of travel. The remaining 30° of movement increase and control the pressure from 40 to 100 lbs. This arrangement controls pressure with critical accuracy in the lower range and provides adequate power for maximum line pull.

For complete details of Foster Air Controlled Catheads see pages 1758, 1759 and 1769 in the Composite Catalog.

AIR SPINNING CATHEAD



AIR MASTER BREAKOUT CATHEAD

PLUS FEATURES of the Air Master Breakout and Air Spinning Catheads: Precise control ● no adjustments ● direct diaphragm actuated ● instant disengagement ● crawl-free drum ● fully enclosed ● quick change jerkline ● peak performance. The Air Master Breakout has a triple plate clutch; the Air Spinning Cathead, a single plate friction clutch for line pulls up to 12,000 lbs.

★ OUR 25 YEARS OF EXPERIENCE ASSURE YOU YEARS OF SERVICE.

Foster CATHEAD COMPANY
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Green Head Service, Oklahoma City, Okla.
Moore Specialty Co., Casper, Wyoming
Texas Warehouse Service, Corpus Christi, Texas
Tillery & Parks, Odessa, Texas
R. D. Cloninger, Lafayette, La.
Peck Sales & Service, Houston, Texas
Rotary Sales & Service, Ltd., Edmonton, Alberta, Canada
L. W. (Lee) Mauck, Great Bend, Kansas
W. O. Nelson, Farmington, N. M.
Langley Y Cia SRL, Corrientes 1115, Buenos Aires, Argentine (Mr. Ken Langley)

G. H. Lewis

T. A. Ramey

## Emsco and D+B Sales Groups Are Reorganized

Reorganization of the Emsco and D+B sales departments to assure closer coordination between machinery and production equipment sales, and between Emsco's sales divisions and its distributors has been announced.

Lloyd M. Bush

G. H. Lewis, as sales manager of the D+B Division of Emsco, will supervise pumping unit sales as well as the sale of all products manufactured my the D+B plant at Garland, Texas. Lewis is completing his tenth year with the D+B Division of Emsco.

Charles J. McLane, Jr., until recently Emsco's sales representative in Tulsa, Okla., has been appointed manager of pumping unit sales. McLane has been with Emsco since September, 1944, starting as a service representative in Shreveport.

Heading Emsco's sales for the Mid-Continent area, excluding the D+B Division is T. A. Ramey, who has been associated with manufacturers of drilling and production equipment in various capacities during the past 20 years. He is a graduate of the University of Southern California, with a degree in petroleum engineering.

Lloyd M. Bush, who has filled many sales positions with the D+B Division of Emsco during the past 15 years, has been selected to direct all Emsco and D+B sales in California. Prior to his appointment as California sales manager, Bush had been D+B Sales Manager for the coast area. T. Clarence Phillips, associated with Emsco since 1934, has been appointed California sales manager for D+B reporting to Mr. Bush.

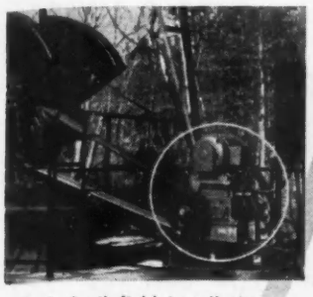
California manager of pumping unit sales will be Robert D. Cassel, who has had extensive industrial sales experience on the West Coast. Machinery sales for California will continue under the direction of D. A. Carnahan, who has represented Emsco in that capacity since 1950.

Rounding out the sales and service team, E. L. Cole has been appointed as field service manager for the Mid-Continent, and M. A. Simmons as sales engineer for all Emsco machinery.

## Oilwell Appoints Jackson Manager of Wyoming Store

E. F. Jackson has been appointed manager of the Casper, Wyo., store of United States Steel's Oil Well Supply Division.

A native of Oklahoma, Jackson first entered the employ of "Oilwell" in 1937. He held various sales positions with "Oilwell" in Oklahoma and Wyoming before assuming his present duties.



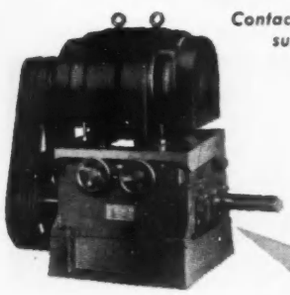
Typical oil field installation on single reduction pumping unit pumping 10, 13, 16 and 19 SPM.

*New!*

**VARY SPMs at the TWIST of a WRIST!**

**4-SPEED TRANSMISSION 1 THRU 60 H. P. FOR ALL TYPES and SPEEDS of ELECTRIC MOTORS and GAS ENGINES**

Consider these applications and problems! Single Reduction Pumping Units—Pump as slow as conditions require—Double Reduction Units too—Tri-Plex and Centrifugal Pumps for Water Flood—Offers 4-Speed Flexibility—Pipe Line Gathering Pumps—Correcting Cold Weather Difficulties—Repressuring Plants—Geared Powers—Refineries—Drilling Rig Accessories—All Turner Transmissions are especially designed and guaranteed for continuous Oil Field Duty.



*Contact your local oil equipment supply store or write:*

**TURNER UNI-DRIVE Company**

3418 Terrace Street — Kansas City 8, Missouri

• Imagine it! Over 200 varied uses and adaptations for this powerful Beaver Pipe and Bolt Machine. Cut, thread or ream pipe from ⅛" to 2" . . . up to 12" with a drive shaft. Cut bolts from ¼" to ⅞" — thread bolts ¼" to 2". No coddling . . . flip the switch and it's ready to work for you . . . and, at an astonishingly low maintenance cost (one user reports only $2.75 spent on repairs other than dies over a 9-year period of active use). Don't take chances! Be ready for any job. Write for complete details of Beaver Model "A" Pipe and Bolt Machine now . . . and, remember, you get over 200 varied applications with the Beaver Model "A".


WRITE FOR YOUR BEAVER QUICK-REFERENCE CATALOG NOW!
A quick-reference catalog giving complete information, sizes and prices on each Beaver unit. Write for yours today!

**BEAVER PIPE TOOLS**

254-300 Dana Ave. • Warren, Ohio, U.S.A.

"53 Years of Highest Quality"



***Why Drill a Dry Hole?***

**PROVEN GEOPHYSICS**

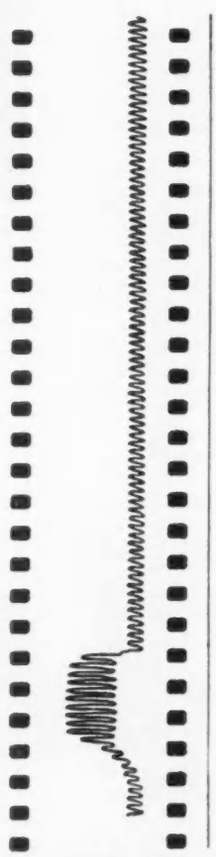
***The Amazing Attractometer***

The latest and most modern method of geophysical exploration that shortens the route to petroleum reserves by rigid instrumental recordings, indicating the existence or not of hydrocarbon accumulations, the approximate depth and quantity underlying the tested area; ten locations for a major oil company without error. Surveys conducted on acreage basis for cash fee and chance to earn small override, oil payment, leases or other interest, where saturation is indicated in commercial quantities. Full information on request.

**To establish conclusive proof of the accuracy of our geophysical work, we will test and record on tape bearing your signature one or more wildcat locations in advance of drilling, indicating the existence or not of petroleum in commercial quantities underlying the tested areas and at what depth it may be found.**

**GEOPHYSICAL SURVEY SYNDICATE**

**4133 Sunnyslope, Sherman Oaks, Calif. Phone STate 46903**



**Specimen of tape indicating saturation**



***USE THIS NEW SAFETY MATERIAL ALL OVER YOUR PLANT***

**Work platforms**

**Flooring**

**Gutter Covers**

**Partitions**

**GRIP-STRUT**

***Safety*** **GRIP-STRUT** **Pat. Pending**

***NON-SKID—RUGGED—LOW COST***

Safety Grip-Strut is a new basic material. All one piece, steel or aluminum, in various sizes and gauges. Sold like lumber, used like lumber and stocked in your storeroom like lumber. Ideal for on-the-job fabricating. Not welded, riveted or expanded. It presents an open space, in a diamond shaped pattern, in excess of 75% of the area for ready access of light and air and gives a positive NON-SKID footing in all directions. Ideal for stair treads, fire escapes, cable trays, work platforms, catwalks, flooring and for original equipment safety treads. Your own mechanics can install it—it's inexpensive, yet permanent and safe.

*Write today for new catalog showing loadings and methods of easy application in your plant.*

**Distributors in all principal cities.**

**GRIP-STRUT division**

**THE GLOBE COMPANY**

Manufacturers since 1914

4008 S. Princeton Ave. • Chicago 9, Ill.

37th YEAR
SERVING THE OIL FIELD AND ASSOCIATED INDUSTRIES
IF WE DON'T HAVE IT — WE WILL MAKE IT
FIRST-CLASS MACHINE SHOP
• MODERN MECHANIZED GRAY IRON FOUNDRY
WE SPECIALIZE IN . . .
★ REBUILDING AND TESTING ENGINES • COMPRESSORS AND PUMPS
★ NEW AND REBUILT OIL AND GAS FIELD SUPPLIES AND EQUIPMENT
★ REPAIR AND REPLACEMENT OF ALL INDUSTRIAL EQUIPMENT
SUPPLIES · EQUIPMENT · REPAIRS
WE can FILL YOUR NEEDS
WRITE OR WIRE US, TODAY
PHONES 874 - 875
ACME FOUNDRY & MACHINE CO.
COFFEYVILLE • KANSAS

Lift, Push or Pull AT ANY ANGLE with a SIMPLEX LEVER JACK

MODEL 310-A EMERGENCY JACK
with four-way lift power
1. On the rotating cap.
2. On the auxiliary cap shoe (two positions).
3. On the machine corrugated toe.
4. At any intermediate point, using chain as sling.
LIFTS 15 TONS A FULL 14 INCHES
Model A-1022 Ratchet Lowering Jack has aluminum housing which reduces weight to 42 lbs. Capacity 10 tons.
WRITE FOR COMPLETE INFORMATION
Simplex LEVER · SCREW · HYDRAULIC Jacks
TEMPLETON, KENLY & CO.
2549 Gardner Road, Broadview, Illinois
A. C. TEMPLETON, 5627 Del Roy Drive, Dallas, Texas

## New Supply Store Opened

Iverson Supply Company's new supply store at Price, Utah, is shown. A. M. Iverson, Jr., is manager, H. E. Kaley is field man, J. R. Bryant, Jr., is store man and Don P. Steel, warehouseman.

## PESA Officials Are Elected To API Board of Directors

A number of directors and officers of the Petroleum Equipment Suppliers Association have been elected to the Board of Directors of the American Petroleum Institute.

The following were elected at the November meeting for two-year terms: M. E. Montrose, Vice President, Sales, Hughes Tool Company, Houston; A. S. Knowles, President, Parkersburg Rig and Reel Company, Parkersburg, West Virginia; Rodney S. Durkee, President, Lane-Wells Company, Los Angeles.

Completing the second year of a two-year term are: Davis D. Bovaird, President, Bovaird Supply Company, Tulsa (President of the Petroleum Equipment Suppliers Association); O. Hammer, President, Security Engineering Division of Dresser Operations, Inc., Whittier, Calif.

## American Meter Names Two Sales Engineers

American Meter Company has announced the appointment of William N. Donachy and Andrew Sesock to its sales engineering organization.

Donachy joined American Meter as a student in the sales training program after ten years with the natural gas industry in the Southwest. During this period he was associated with the Arkansas-Louisiana Gas Company as meter inspector and the Muscle Shoals Natural Gas Company as a meter supervisor. His new territorial assignment covers southern Kansas, western Arkansas and Oklahoma.

Sesock, a graduate of Yale University and Case Institute of Technology, became associated with American Meter in 1951 as a sales engineer in the Tulsa district. His new appointment as a sales representative is to the Billings, Mont., district.

## Franklin Supply Opens District Office in Denver

Franklin Supply Company has announced the opening of a new district sales office in Denver in the Patterson Building. The office will be under the supervision of Don Davis, who has been with Franklin Supply for five years, holding sales positions in Mt. Pleasant, Mich.; Grayville, Ill.; and Casper, Wyo., prior to his transfer.

Slush Pump RODS & LINERS—

In all stock sizes or to your order.
JP J. P. MACHINE & TOOL COMPANY
1534 S. E. 29th St.,
MElrose 8-8700
Oklahoma City, Okla.
OIL FIELD SPECIALTY ITEMS

JET-LUBE APPLICATOR

ENGINEERED LUBRICATION
JET-LUBE APPLICATOR is used to lubricate tool joints. Forces out drilling fluids and contamination. Replaces with clean grease. Cuts in half the amount of lubricant used. Insures complete joint coverage. Simple, fast, clean and inexpensive.
Order through your supply store or send for complete details
JET-LUBE INC.
7362 W. BEVERLY BLVD., LOS ANGELES 36

# IT FIGURES

IT FIGURES that when an entire industry is dedicated to one proposition—when its very existence depends upon its willingness and ability to serve but one other industry—the continued existence and growth of this industry is ample proof that it has become a complete and indispensable economic entity.

The Supply Industry has grown and expanded to meet the needs of the ever-expanding Petrochemical Industry and it deserves your complete support. You strengthen your own position when you purchase your full requirements ". . . Through Your Supply Store."

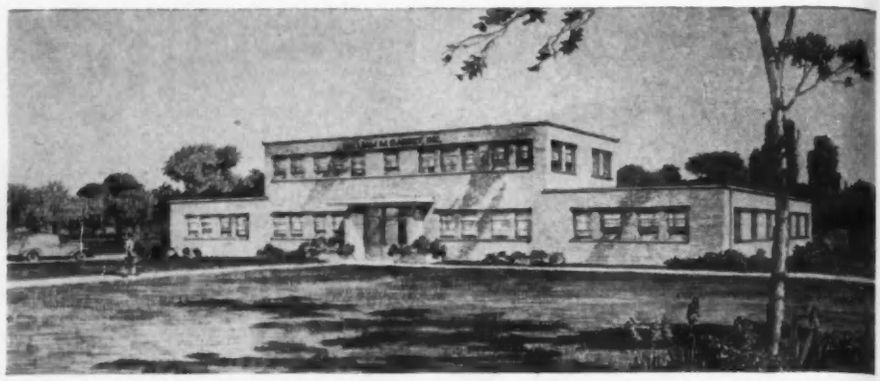
**LARKIN PACKER CO., INC.**
**ST. LOUIS, MO.**

Geyser Cementing Shoes | Cementrol Equipment | Forged Steel Heads | Lok-On Centralizers | Bull Plugs And Nipples

## William M. Barret, Inc. Builds New Geophysical Plant

William M. Barret, Inc., consulting geophysicists of Shreveport, La., has announced the beginning of construction of a new geophysical plant in midtown Shreveport. The new plant will be located on a 6.4-acre tract at the corner of Dalzell Street and Linwood Avenue, but 6 minutes driving time from the principal hotels and 11 minutes from the new Class 5 airport.

Scheduled for completion before the end of the year, the new plant will include the building pictured, which will house the administrative offices, laboratories and instrument shops. Automotive shops will be located in another building, and a third structure will house the paint shop and a covered parking area.



BARRET'S NEW GEOPHYSICAL PLANT

The project, including buildings, real estate and equipment, will represent a total investment of approximately $250,000. Founded 26 years ago, the Barret company has pioneered in the development of the magnetic and radio methods of geophysical exploration. Recent developments include the Radoil method, a radio technique for locating oil fields, and its mining counterpart, the Radore method, for locating ore deposits. As consultants for the petroleum and mining industries, the company operates geophysical crews on a contract basis, and it also acts as licensor of some 40 patents on geophysical apparatus and methods which it controls in the United States and foreign countries.

The research, development and manufacturing activities related to the production of the specialized electronic equipment employed by Barret field crews and those of its licensees will continue to be handled by its affiliated organization, the Engineering Research Corporation, which will also be quartered in the new plant.

## Westinghouse Air Brake Names Squires Controller

Willard D. Squires, former assistant to the controller of the Westinghouse Air Brake Company, has been elected to the position of controller to succeed George V. Myers, who resigned to take another position.

Squires was born in Warren, Ohio, and is a graduate of the School of Business Administration, Ohio State University, where he majored in accounting. Prior to joining the Westinghouse Air Brake Company, Squires was associated with Haskins & Sells, Certified Public Accountants, from 1935 to 1951, except for two years service in the Navy during World War II.

## Assistant Division Sales Manager Named by Security Engineers

The appointment of Tommy H. Patterson to the position of assistant division sales manager for Security Engineers' Oklahoma Division was announced.

Patterson came to Security in 1948, working first as a sales engineer and later as district sales manager in Duncan, Okla. Patterson was recalled to the service in 1950, and upon his release returned to Security.

Prior to joining Security in 1948 he was sales representative for Great Lakes Corporation and before that Patterson was associated with the Skelly Oil Company of Alma, Okla.

**MARTIN-DECKER WEIGHT INDICATORS**

**are Hydraulically Operated...so are the brakes on your car!**

*Both Achieve Results Superior to those possible with Mechanical Actuation*

**The MARTIN-DECKER TYPE "D" WEIGHT INDICATOR and the IDEAL TYPE "D" WIRE LINE ANCHOR Provide the ultimate in Accurate—Sensitive Dependable—Rugged DRILLING CONTROL And WIRE LINE ANCHORING**

*Consider These Advantages*

**of the Martin-Decker Hydraulic Weight Indicator**

- Greater Accuracy (No mechanism to wear out or get out of adjustment).
- More Flexibility.
- Weight Indicator can be located remotely from source of pressure.
- Weight Indicator can be located advantageously for the driller where he can read it.
- Adaptable to all types of rigs and conditions.

**Martin-Decker Weight Indicators Are**

**SEALED**

**For Greater Accuracy and Service**

***No pumping up... No adjusting... No leaks. The Fluid System is factory loaded and permanently sealed. The fluid remains in the unit even during transportation and storage. Fast, foolproof installation—Guaranteed Accuracy.***

*Many Martin-Decker Weight Indicators are in use that are 20-25 years old.*

HOME OF THE WEIGHT INDICATOR

**MARTIN DECKER CORP.**

LONG BEACH, CALIFORNIA

SAN JOAQUIN VALLEY: T. J. CULLEN, BAKERSFIELD, CALIFORNIA
MID-CONTINENT DISTRIBUTOR: REED ROLLER BIT COMPANY, HOUSTON, TEXAS
CANADIAN DISTRIBUTOR: REED ROLLER BIT COMPANY OF CANADA, CALGARY & EDMONTON, ALBERTA

MARTIN-DECKER WEIGHT INDICATORS AND IDEAL WIRE LINE ANCHORS ARE ALSO SOLD THROUGH THE NATIONAL SUPPLY EXPORT CORP., THE NATIONAL SUPPLY CO. AND OTHER RECOGNIZED SUPPLY HOUSES.

# A.P.I. COUPLINGS FOR OIL FIELD USE

## EVERY SIZE AND TYPE FROM *ONE* SOURCE

**LINE PIPE COUPLINGS A.P.I.**
1/8" to 12"—Seamless and Special Processed—Black or Galvanized

**PLAIN TUBING COUPLINGS A.P.I.**
1" to 3"—Seamless

**EXTERNAL UPSET TUBING COUPLINGS A.P.I.**
3/4" to 3 1/2"—Seamless

**CASING COUPLINGS A.P.I.**
4 1/2" to 13 3/8"—Long or Short

**HYDRAULIC COUPLINGS**
1/8" to 3"—Seamless

**REAMED AND DRIFTED A.I.S.I.**
3/4" to 12"—Seamless or Spl. Processed

**DRIVE PIPE COUPLINGS**
3/8" to 12"—Seamless or Spl. Processed

***Consult Our Nearest Quick Service Sales Office:***

Albany, N. Y.—Albert L. Becker, 434 Clinton Ave.
Baltimore—Ted Barto, 2301 N. Charles St.
Buffalo—W. E. Spencer Assoc's, 241 S. Elmwood Ave.
Chicago—Harry A. Jay, Suite 1090 Old Colony Bldg.
Denver—Earl H. Jones & Co., 1863 Wazee St.
Detroit—Thomas L. Osberger, 10226 Woodward Ave.
Erie, Pa.—R. J. Maggi, Box 711
Falmouth, Mass—Wm. F. Bennett, 53 Minot St.
Ferguson, Mo.—Wm. H. Heckenberg, 635 No. Florissant Road
Houston—Henry H. Paris Distributor, Inc., Box 932
Los Angeles—James A. Riordan Co., 1400 Santa Fe Ave.
Minneapolis—Lin J. Krause, 200 Lumber Exchange
Narbeth, Pa.—J. W. Worthington, 105 Forrest Ave.
Newark, N. J.—Murray Eskin, Industrial Office Bldg.
New York—Henry Stein, 50 Cliff St.
Portland, Ore.—Earl H. Jones & Co., 1233 NW 12th Ave.
Richmond, Va.—P. C. Abbott & Co., 15 E. Franklin St.
San Francisco—Earl H. Jones & Co., 1150 Folsom St.
Seattle—Earl H. Jones & Co., 819 Thomas St.

**Factory Phone: Woodsdale 3296**

## WHEELING MACHINE PRODUCTS COMPANY

ELM GROVE STATION — WHEELING, W. VA.



# WICO MAGNETOS are built for tough oil field service

Put an end to your ignition worries, by specifying Wico Magnetos on your new power units . . . and by replacing with Wico whenever an engine gets an overhaul.

You'll find thousands of Wico Magnetos at work on oil field production equipment . . . like the Lufkin engine shown below. Manufacturers choose them as original equipment, because they know Wico's record for dependable service under the toughest field conditions.

A big favorite for oil field engines is the Wico XHD Magneto—which incorporates such heavy-duty features as a surge-wound, plastic-encased coil; rugged, one-piece rotor; and amply sized tungsten contacts.

We'll be glad to send full details on Wico Magnetos and magneto-mounted distributors, and to give you the name of your local Wico Service Station.

Wico Model XHD ▲
Heavy duty magneto

Lufkin TC-2A-35A Pumping Unit ▶
driven by Lufkin H-333 Gas Engine

**WICO ELECTRIC COMPANY**
**West Springfield, Massachusetts**

*Manufacturers of Wico "Autostop" and the "Puff-A-Lite" Automobile Lighter*

WICO

Millions of users agree—
you cut more pipe with less work
with RIDGID
Heavy-Duty Cutters

There's a big difference in pipe cutters—and you're sure of it the first time you slap a RIDGID on a pipe (any kind) and see how easily cleanly it rolls through the metal. Beautifully balanced for easy action. Factory tested for perfect tracking—and guaranteed warp-proof housings of special malleable hold it. High alloy thin-blade or heavy-duty cutter wheels that leave practically no burr. You cut pipe fast with least effort. Ask your Supply House for the more-for-your-money RIDGID.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO

RIDGID
Work-Saver Pipe Tools

## Rockwell Returns as Chairman Of Rockwell Manufacturing

Col. Willard F. Rockwell, who has resigned as assistant to Secretary of Defense Charles E. Wilson, has returned to his position as chairman of the board of directors of Rockwell Manufacturing Company.

Col. Willard F. Rockwell

Colonel Rockwell joined the Defense Department last April at the request of President Eisenhower and Secretary Wilson. His task was to convert the Army and Navy Munitions Board into the new office of assistant secretary for supply and logistics, an assignment he completed July 1.

Later the Colonel was asked to make recommendations on the most economical way to procure munitions for NATO forces. This assignment sent him to Paris in July for two weeks of conferences with the NATO working groups. Before joining the Defense Department, Coloniel Rockwell took part earlier this year in the Mutual Security Agency evaluation study of American aid abroad as assistant to MSA Director Harold Stassen.

## Fetzer Named Managing Director Of Continental Supply Limited

Earl M. Fetzer has been appointed managing director of The Continental Supply Company, Limited, with headquarters in Calgary, Alberta, Canada. Fetzer succeeds J. H. (Jack) Berry, who resigned to become managing director of the Devon Drilling Company Limited.

Earl M. Fetzer

Fetzer joined The Continental Supply Company following his graduation from Oklahoma A. & M. College with a degree in mechanical engineering in 1929. He has had extensive experience in practically all areas of the United States and Canada. He was manager of the Production Equipment Division of the parent company for 12 years prior to his transfer to the Canadian company in the same capacity in January of this year.

## Foster Cathead Company Ownership Changes Hands

Ownership of Foster Cathead Company, Wichita Falls, Texas, has been acquired by three active members of the firm, W. W. Foster, general manager; J. Lewis Foster, engineer; and Glenn E. Tedford, sales and service manager.

Foster, whose 52 years in the oil industry make him one of oildom's real old-timers, established the company in 1927. His oil field experience began in 1901 at Spindletop, where he was a drilling contractor.

The recent change in ownership, Foster points out, does not alter the company's management or facilities, either engineer-

ing-wise or field service-wise. The engineering end of the firm has been directed since its early days by J. Lewis Foster, son of W. W. Foster; and Tedford, son-in-law of the elder Foster, has been globe-trotting as Foster Cathead's field service expert since 1946. The three men are equal partners in the firm.

## McCullough Tool Company Opens New Sales Office

McCullough Tool Company recently opened a new sales office at 1334 Fidelity Union Bank Building, Dallas, Texas. The new office, in charge of John W. Watson, will service the oil industry in the Dallas-Fort Worth area. The opening of this new office gives the McCullough Tool Company a total of thirty-one locations in the Eastern Division.

John W. Watson

Watson, a native of Kilgore, Texas, attended Stephen F. Austin College in Nacogdoches, Texas, and later graduated from Texas A. & M. He joined McCullough Tool Company in June, 1951. Prior to that he had been associated with the Gulf Oil Corporation. Before his appointment to the new Dallas office, Watson was a sales engineer working out of the Eastern Division headquarters at Houston.

## Baash-Ross Assigns Garrett To New Mexico Sales Area

H. L. Garrett, Baash-Ross sales representative, has been assigned to cover the field activities in the "Four Corner" area of New Mexico, Colorado, Utah and Arizona.

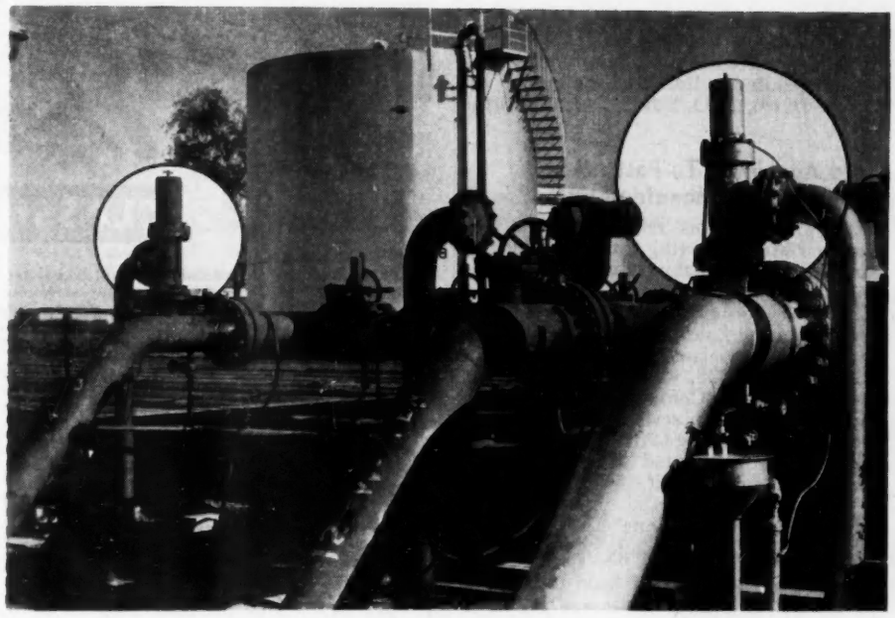
H. L. Garrett

Garrett has had experience in oil field work, in field construction operations and in sales work in the West Texas-New Mexico area. Garrett will work out of Farmington, N. M., and will spend the remainder of his time covering other parts of the West Texas-New Mexico area out of the Baash-Ross plant at Odessa, Texas.

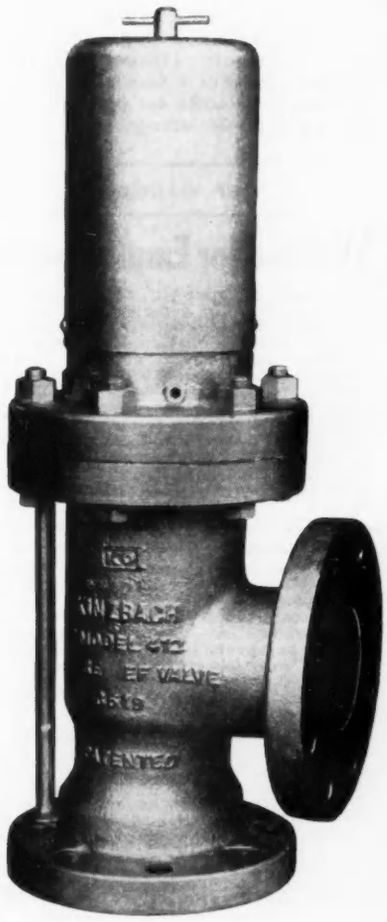
## Drilling Equipment Sales Announces New Service

Drilling Equipment Sales Company of Fort Worth, Texas, known as DESCO, has announced a new service to the drilling industry. Desco solicits listings of idle and surplus drilling equipment as well as used equipment needs. The firm publishes a monthly catalog including all current listings.

This service is designed to give information to contractors who do not have time or means to dispose of surplus or idle used equipment and need to locate idle equipment which other contractors may have for sale. Another feature of the service is to arrange for rentals of equipment between contractors—while a major drilling item is idle to one contractor, another may wish to

**Positive Protection Against Pressure Surges**



**KINZBACH**
**MODEL 412**
**RELIEF VALVE**
**for Pipelines and Refineries**

When a pressure overload in the line is reached, the Kinzbach Model 412 Relief Valve opens instantly to full capacity. This valve provides automatic resetting at a pre-determined pressure drop, positive seating and facilities for functional testing.

The Model 412 uses line pressure for opening and closing. The opening pressure is preset by application of a dead weight load. Opening and closing action is positive and reliable. The pre-set pressure never changes.

Kinzbach Model 412 Relief Valves are available in 2", 3", 4", 6" and 8" sizes for working pressures up to 1000 p.s.i. Write for Bulletin RV412 for full technical data.

KINZBACH TOOL CO INC

**KINZBACH TOOL COMPANY, INC.**

P. O. Box 277 Houston, Texas

Export Office: 74 Trinity Place, New York, N. Y.

rent it for a short period.

The business is operated as a brokerage firm or real estate dealer. Contractors may obtain details or list idle equipment by writing Desco, P. O. Box 547, Fort Worth, Texas.

## Laird Appointed To Post With Cardwell Manufacturing

Lee J. Laird has recently joined the Cardwell Manufacturing Company, Inc., of Wichita, Kansas, as its California representative.

Laird was formerly assistant general sales manager of the Baash-Ross Tool Company. He has been associated with the petroleum industry since 1928, working first with the Republic Supply Company of California. Laird also served for several years in executive positions with the Chiksan Company.

Laird will be located at 1730 Kanola Road in LaHabra, Calif.

## John A. Roebling's Sons Announces Appointments

Forest S. Burtch has been appointed product sales manager of the newly formed Construction Materials department of the John A. Roebling's Sons Corporation, a subsidiary of the Colorado Fuel and Iron Corporation. Elmer A. Trask has been named to succeed Burtch as wire rope sales manager. Both men will work out of the corporation's Trenton headquarters.

For the past ten years, Burtch has held several executive sales positions in the Roebling firm. A graduate of Syracuse University, he joined the Roebling Wire Rope Engineering Division staff in 1923, and in 1934 was appointed assistant chief engineer.

Trask held the position of Chicago district manager for the John A. Roebling's Sons Corporation from 1950 until his present appointment. He has been associated with Roebling's for 29 years, starting as a warehouseman and splicer in the San Francisco office. In 1931 he became a salesman, and in 1936 was made manager of the San Francisco office.

## Koehring Announces Promotion of E. A. Smith

Koehring Company has announced the appointment of E. A. Smith as vice president and manager of its two export sales subsidiaries, Koehring Inter-American Company and Koehring Overseas Company.

Smith formerly was a sales engineer for C. S. Johnson Company of Champaign, Ill., a Koehring subsidiary. He has moved to Milwaukee, where offices of overseas subsidiaries are located. Smith replaces R. E. Stewart, who resigned recently.

## Youngstown Sheet and Tube Promotes Leroy Stewart

Leroy V. Stewart of Chesterton, Ind., has been appointed general chief clerk of the Strip and Tin Accounting department of The Youngstown Sheet and Tube Company. He succeeds W. G. Pocock, retired.

Stewart is a native of Washington, Pa., attended public schools in Benwood, W. Va., and the University of West Virginia. He joined Youngstown's Harbor Works here in 1920 as a payroll clerk and has held positions of mill superintendent's clerk, cost and production accounting, chief clerk of the Hot Strip and other units of accounting.

### FOR SALE

■ For liquidation. 1,500 acre Federal Lease San Juan County, New Mexico. $360,000 court judgment 33,000 acres Missouri; may have oil future. Box 8-W, World Oil, Houston, Texas.

# WORLD OIL'S Trading Post

## CLASSIFIED ADVERTISING

**RATES: Regular Classified** (undisplayed) **set in this size type: 12 cents per word. Minimum charge, $3. Blind box address in our care counts six words. Replies forwarded without charge. Situation wanted ads, 6 cents per word. Display ads, set in suitably larger type with ruled border, $12 per column inch; situation wanted display ads, $6 per column inch. Ten percent discount for two or more insertions of same copy in consecutive issues. All classified ads payable in advance. COPY DEADLINE: 5th of month preceding date of issue. Send copy and checks to: Trading Post Section, World Oil, P. O. Box 2608, Houston, Texas.**

### SITUATIONS WANTED

**Drilling contractor operating in West Texas and New Mexico desires to contact small or medium-sized independent oil company who needs an operating manager. Personal interview desired. Twenty years experience in all phases of the oil industry. Address replies to Box 94-W, WORLD OIL, Houston 1, Texas.**

■ Petroleum Engineer and Geologist, 14 years with major oil company, having wide domestic and foreign experience in sub-surface geology, reservoir engineering and valuation. Box 10-W, c/o World Oil, Houston, Texas.

**EXPERIENCED SECRETARY DESIRES FOREIGN EMPLOYMENT—South America Preferred. 32, single, 13 years' diversified experience, including 4 years overseas in petroleum, construction and importing. Box 9-w, c/o World Oil, Houston, Texas.**

### HELP WANTED

**Wanted for Employment**

**Petroleum engineer or geologist with two or three years experience in Louisiana Gulf Coast. Duties will entail preparation and maintenance of detailed structure and Isopach maps of South Louisiana fields and evaluations necessary in field studies. Work located in New Orleans with reliable and financially strong concern. Reply giving age, experience in detail, and salary desired. Inquiries will be kept strictly confidential. Our employees know of this ad. Box 6-W, c/o WORLD OIL, Houston, Texas.**

**Experienced Seismologists, Party Chiefs, Seismic Computers and Observers by major oil company.** Seismologists will be permanently located in Mid-Continent Area. Applicants should have geological and/or geophysical background or at least five years practical experience. Give full details of education and experience in letter. Reply to World Oil, P. O. Box 14-W, Houston 1, Texas.

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# New Books, Maps and Movies

**SPINDLETOP**, James A. Clark and Michel T. Halbouty, Random House, New York, 1952.

We have just re-read J. A. Clark and Mike Halbouty's "Spindletop" and we can commend it heartily again to all oil men but especially to those, young and old, of Texas and Louisiana.

When we made our first contact with oil men, back in the fall of 1916 as oil editor of the Houston Post, and then early in 1917 as editor of the Gulf Coast Oil News (now WORLD OIL) we almost daily met the figures who are pictured in "Spindletop." We knew them as extremely human figures—which is exactly how Clark and Halbouty have pictured them. We learned firsthand of the organization and spectacular growth of some famous companies, Gulf, Texas, Sun, Magnolia, Humble, and heard the same fascinating detail the authors put into "Spindletop." The book has now reached about 20,000 copies—and deservedly so.—R.L.D.

•

**OIL IN THE SOVIET UNION**, Heinrich Hassmann, Princeton University Press, Princeton, N. J., 1953, $3.75.

Dr. Hassmann, writing in Western Germany, explores one of the virtual unknowns in the Russian power equation: the oil industry. He discusses the czarist and Soviet frameworks in which the industry matured, then traces the development of the industry itself. Careful descriptions of important oil producing and oil refining regions in the USSR are given with strengths and weaknesses examined. Alfred M. Leeston has done the translation, adding notes, latest statistics, a bibliography and an index. E. DeGolyer, leading petroleum geologist, has written a foreword.

•

**THE PERMIAN REEF COMPLEX OF THE GUADALUPE MOUNTAINS REGION, TEXAS AND NEW MEXICO**, A study in Paleoecology, Norman D. Newell, J. Keith Rigby, Alfred G. Fischer, A. J. Whiteman, John E. Hickox, and John S. Bradley, W. H. Freeman & Company, San Francisco, 1953. $7.50.

According to the authors this volume is an attempt to determine the environmental conditions under which the celebrated Permian reefs and associated deposits of the southern Guadalupe Mountains were formed. Conclusions are based mainly on original studies of stratigraphy, petrology, primary structures and paleontology. There are 85 illustrations in the book, including four folding charts, 225 halftone illustrations on 32 plates.

•

**GAS MAP OF TEXAS, NEW MEXICO, LOUISIANA, S. ARKANSAS, MISSISSIPPI AND ALABAMA**, Revised edition, Commercial Drafting Service, P. O. Box 6277, Houston 6, Texas.

The lithographed gas map of these six states originally published in January, 1952, has been revised. It has been overprinted in black on the 1952 map and shows new pipe lines, pipe line corrections and new fields as of September 1, 1953. Only a limited number are available. The map sells for $25 for the complete three sections and $15 for the central section.

•

**ABC'S OF OIL**, Jerome B. (Jerry) Robertson, Petroleum Publishers, 118 NW First Street, Evansville, Ind., $2.

An oil primer written for the layman, this book is based on the author's 15 years of experience writing about oil for the lay reader and tries to acquaint new oil firm employes, traders, landowners and speculative investors with the facts and mechanics of oil field work. It contains 86 pages and is illustrated with photographs and line drawings including a two-page spread showing the Basin areas of the United States.

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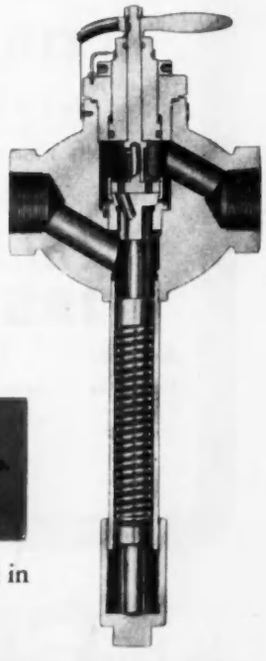

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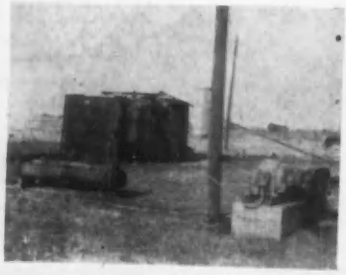

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## SQUEAKS from the BULLWHEEL

### Advice

Grandma was giving the new bride a heart-to-heart talk. "Child, I hope your lot's going to be easier than mine," she said. "All my wedded days, I've carried two burdens—pa an' the fire. Every time I turn to look at one, the other goes out."

### No Lawyers?

Once upon a time the fence between Heaven and Hell broke down. St. Peter appeared at the broken section and called out to the devel: "Hey, Satan, since all the engineers are over in your place, how about getting them to fix this fence?"

"Sorry," replied Satan. "My men are all too busy to go about fixing measly fences."

"Well, then," replied St. Peter, "I'll have to sue you if you don't."

"Oh yeah," countered the devil, "and where are you going to get a lawyer?"

### Houses Come High!

A man was complaining that he had just bought a prefabricated house, and that it had, in the end, cost him $40,000.

"Forty thousand!" exclaimed one of his friends. "Isn't that an awful lot to pay for a prefab?"

"Yes," said the home-owner. "It wasn't so much to begin with, but I told the factory I wanted it right away, and they sent it to me airmail."

"Man, that's what I call a well!"

### Best Gag

A psychiatrist was examining a selectee.
Psychiatrist: "What's your occupation?"

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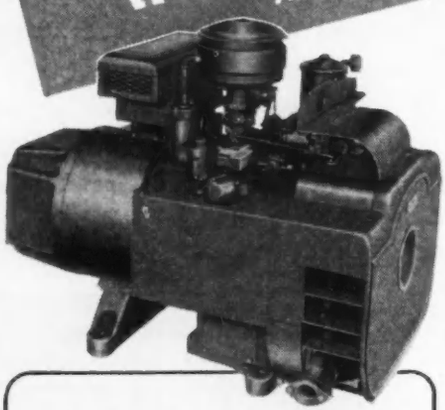

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### Exhibit A

The county fair in western Kansas had as its chief attraction the grand champion bull, and a farmer from Great Bend had made the trip with his whole family just to see the bull.

At the entrance, however, he discovered that he and his wife and his five oldest children would have to pay fifty cents each and the other seven children twenty-five cents. The farmer began to argue loudly and finally the manager came and asked what was the matter.

"We've traveled nigh on to a hundred miles," said the farmer, "to see that champion bull, but I'm danged if I can afford $5.25 to get in."

"Are all those children yours?" the manager asked.

"They sure are," replied the farmer.

"Let 'em in free," the manager told the gatekeeper. Then he turned to the farmer. "We want the bull to see you."

### 'Young' Love

Gramps was getting married for the second time. Asked why he was marrying a nifty chorus girl from the city, instead of a woman his own age, Gramps said, "Well, son, I'd a sight ruther smell perfume than liniment!"

### Unsuccessful Day

Little Annie had been to school for the first time.

"Well, darling, what did you learn?" asked her mother on Annie's return.

"Nothing," sighed Annie hopelessly; "I've got to go back tomorrow."

"We're going to make a few changes around here—know anything about elevators?"

### No Good

"Well, my boy" said the new minister to the three-year-old, "What did Santa bring you?"

"Aw, he brought me a little red chair. But it isn't any good. There's a hole in the bottom of it."

### But Happy

The horse trainer confessed that just before the big race he had given his nag a big shot of whiskey. "Did he win?" asked a friend. "Nope," said the trainer, "but he was the happiest horse in the race!"

### Wrong Order

When little Susy came home after a visit at her grandmother's, she found that triplets had been added to the family.

"How silly of you, Mommy," she said. "You should have done the ordering—you know how Daddy stutters."

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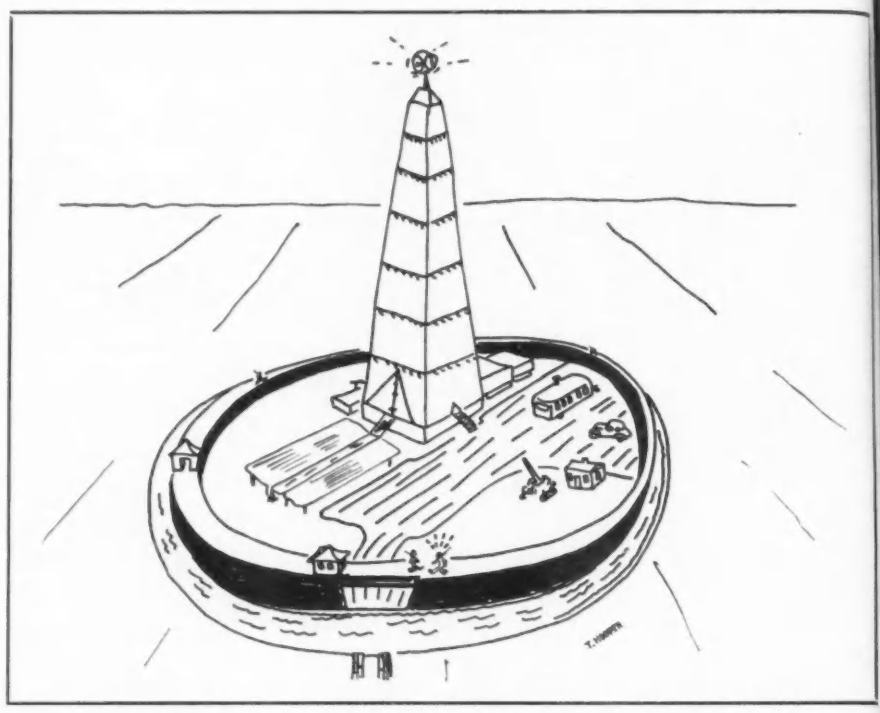
Once upon a time, there was a man whose ears rang and whose eyes bugged out. He had gone to all kinds of specialists for treatments of the peculiar ailment causing his ears to ring and his eyes to bug out. He had his teeth removed, his tonsils removed, his appendix removed, but still this poor man's ears rang and his eyes bugged out.

Finally, in despair, his physicians gave him only three months to live, so he decided to go on a long vacation to spend his few remaining days. Deciding to have only the best for this last fling, he went to the most exclusive haberdashery where he bought a $175.00 suit, a $10.50 tie, and then ordered his shirt. He told the salesman that he wanted a very expensive shirt in size 14½. The salesman looked at him and suggested that he should have a larger shirt. However, the man insisted that he had worn a 14½ shirt for the past fifteen years and would continue to wear a 14½ until he died.

"All right," said the salesman, "But it's a wonder to me that your ears don't ring and your eyes bug out."



"When the Boss says, 'Tite Hole,' he means 'Tite Hole, doesn't he?"

### No Market for Homes

A real estate salesman who tried to sell a home to a newly-wed couple approached the bride describing the virtues of a home. She replied: "Why do I need to buy a home or make a home? I was born in a hospital, reared in a boarding school, educated in a college, courted in an automobile, and married in a church, get my meals in a cafeteria, earn my livelihood on a job, live in a rooming house, spend my leisure hours in a night club; when I'm sick, I go to the hospital and when I die, I'll be buried from the undertaking parlor. All I need is a garage with a bedroom."

### Just Hollerin'

The celebrated soprano was doing a solo when Bobby said to his mother, referring to the conductor of the orchestra:

"Why does that man hit at that woman with his stick?"

"He's not hitting her," replied the mother, "Keep quiet!"

"Well, then, what's she hollerin' for?" asked Bobby.

### The Last Word

While attending a night club with her favorite escort, a young woman went to the powder room where she met several friends she hadn't seen in ages. The conversation was gay and gossipy and went on and on and on. Then the maid handed her a note from her escort. In a bold, male hand were the word: "Can't understand why you havn't written."

### Well, Girls!

A farmer's wife objected to her husband's parrot. To keep peace in the family, he decided to get rid of the feathered chatterbox. The next time he took a crate of chickens to town he also loaded the parrot on the wagon.

About half way there he heard his chickens squawking and the parrot screeching. Finally he looked back and saw all his chickens walking in the road behind the wagon and the parrot marching back and forth on the tail board, screaming in frustrated anger: "Any of you girls changed your minds yet?"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# EDITORIAL INDEX

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**Index by Authors . . . . . Pages 2 to 6**
**Index by Subject Matter . . . . . Pages 7 to 19**

# AUTHOR INDEX


A

**ALCORN, C. H.**
New Drilling Equipment Reflects Industry-wide Cooperation ..... Feb. 15 152

**ANDERSON, KEITH**
New Mexico Drilling Still Active ..... Oct. 156

**ARMSTRONG, J. F.**
28,000 Barrels of Brine Disposed Daily in Six Wells at Loudon ..... Jan. 164

**AUSTIN, GEORGE**
How You Can Combat Hydrogen Sulfide Hazards ..... Nov. 190

B

**BACHMAN, WILLIAM S.**
Rubber Stabilizers Are Solving Permian Problems ..... Oct. 195

**BAKER, WARREN L.**
Excessive Gasoline Stocks Likely ..... Jan. 44
Good Things Ahead ..... Jan. 41
Higher California Prices Needed ..... Feb. 1 37
Drilling Costs Too High ..... Feb. 1 49
Drilling Forecast Is for 46,988 New Wells ..... Feb. 15 129
General Crude Price Increase Unlikely ..... March 40
Politics Threaten World Oil Adequacy ..... April 90
Water-Flooding Like Wildcatting ..... May 75
Economic Picture Brightens ..... May 98
Costs Can Be Cut ..... June 41
Reduced Crude Stocks Desirable ..... June 64
High Supply Endangers New Prices ..... July 84
Picking on Oil Again ..... Aug. 1 57
Excessive Supply Darkens Outlook ..... Aug. 1 80
U. S. Drilling Record Forecast in 1953 ..... Aug. 15 102
Drilling Costs Slow Discovery Rate ..... Sept. 73
Contract Drilling Highly Competitive ..... Sept. 78
Gasoline Stocks Are Too High ..... Sept. 96
Cartel Suit Should Be Heard ..... Oct. 93
Output Must Be Curtailed ..... Oct. 116
Economic Position Improves ..... Nov. 82
Better Use of Statistical Data ..... Dec. 57
Economic Position Can Be Improved ..... Dec. 80

**BALDWIN, FRANK N., JR.**
Field Testing Can Prevent Flange Leaks ..... May 201

**BALL, MAX W.**
Oil Vs. Politics ..... Feb. 1 67

**BARRETT, H. M. (BILL)**
Aeration of Drilling Fluids . . . A Solution to Lost Circulation? ..... Sept. 145

**BARROWS, GORDON H.**
Private Capital on Road to Getting 'Fair Shake' Abroad ..... Aug. 15 85

**BEARDEN, WILLIAM G.**
New Multiple Fracturing Process ..... Jan. 159

**BEDIZ, P. I.**
Interpretation of Seismic Data in Locating Reefs in Alberta ..... Feb. 1 86

**BELL, FRANK S.**
Planning Cuts Mud Costs ..... Feb. 1 134

**BERGMAN, W. E.**
Filter Press Control Facilitates Lab Scheduling ..... Nov. 151

**BINNING, RALPH L.**
Efficiency Curbs Canadian Drilling Costs ..... Feb. 15 286

**BLAIR, RALPH F.**
Maintenance Means Money in Your Pocket ..... Sept. 156

**BLAKE, J. W.**
Industry Report—How Are Gas Turbines Doing? ..... Nov. 222-C

**BLANCHET, P. H.**
Accessibility Surveys Cut Costs ..... Dec. 93

**BLICK, ROBERT G.**
How Flanges Work and Why They Look ..... March 222-A

**BLISS, JACK E.**
Vacuum Method Detects Gas-Bearing Formations ..... Oct. 218

**BOATMAN, JOHN A.**
What Should Be Done to Protect Engines? ..... Nov. 122

**BOBO, ROY A.**
Aeration of Drilling Fluids . . . A Solution to Lost Circulation? ..... Sept. 145

**BOYER, A. J.**
How to Maintain Correct Engine Temperatures ..... March 114

**BRADLEY, R. I.**
How to Present Property Appraisal Data ..... Jan. 68

**BRANTLY, J. E.**
PAD's Foreign Program Calls for Expanded Activity ..... Feb. 15 278

**BRESTON, DR. J. N.**
Conditioning Engine Exhaust Gasses for Repressuring. Sept. 224

**BROOKS, ROBERT W.**
Specific Heat Data and the Natural Gas Compressor Plant ..... Nov. 222-L

**BROUSSARD, W. L.**
Here's How to Rig a Unitized Trap ..... April 174

**BRUBECK, WILLIAM E.**
What Are the Opportunities in the Illinois Basin? ..... May 111

**BUCHANAN, A. C., JR.**
Electronics Speeds Gas Volume Calculations ..... March 186

**BUGBEE, J. M.**
Lost Circulation Can Be Avoided or Minimized ..... May 150
Procedures to Be Used in Fighting Lost Circulation .. June 132

**BURGESS, GERALD**
Ohio's Slim Hole Rig Cuts Exploratory Drilling Costs. June 107

**BURGOYNE, J. H.**
How to Control Storage Tank Fires ..... Feb. 1 232-A

**BURKE, JOHN H.**
How to Plan a Brush Control Program ..... Sept. 246-P

C

**CARPENTER, DAN H.**
Don't Let Corrosion Eat Up Your Profits ..... Feb. 1 172

**CARPENTER, P. G.**
Boron Compounds Used As Water-Flood Tracers ..... April 214

**CARPENTER, PAUL G.**
New Correlation Simplifies Pressure Gradient Calculation in Tubing ..... June 161

**CARSON, L. C.**
They're Overcoming Drilling Problems ..... Aug. 1 146

**CERINI, WILLIAM F.**
How to Test Quality of Injection Water ..... Aug. 1 189

**CHISHOLM, FRED**
How to Train Mud Engineers ..... Jan. 115

**CHURCH, CLIFFORD C.**
Foraminifera—An Evaluation ..... April 75

**CLARK, C. W.**
Guess Work Is Removed in Flood Evaluations ..... May 216

**CLARK, NORMAN J.**
It Pays to Know Your Petroleum
(Part 1) ..... March 165
(Part 2) ..... April 208

**CLINKENBEARD, P. S.**
Compressed Gas Cuts Carthage Acidizing Costs ..... Aug. 1 180

**COBLENTZ, ROBERT C.**
Absorption Unit Cools Air Intake ..... Oct. 304-N

**COOK, W. H.**
Do You Have a Problem of Direction Drilling? ..... July 129

**COOPER, G. CARL**
How Are Gas Turbines Doing? ..... Nov. 222-E

**COREY, B. H.**
Efficiency Curbs Canadian Drilling Costs ..... Feb. 15 286

**CORMACK, L. J.**
Here's How to Check Motor Trouble ..... Aug. 1 210-A

**CORNELL, DR. DAVID**
New Methods Estimates Gas Well Performance ..... Jan. 180
Permeability Determined from Production Data .... Feb. 1 186

**COZZENS, F. R.**
Stop that Thief! ..... May 234

**CUMMINGS, J.**
Nottinghamshire County ..... Aug. 1 230

D

**DAGGS, GEORGE L.**
Closed Steam System on Drilling Rigs Cuts Boiler Maintenance, Fuel Needs ..... Jan. 132

**DAVIDSON, H. M.**
Selling Safety . . . The Goal of the AAODC ..... Sept. 168

**DAVIS, MORGAN J.**
The Petroleum Geologist ..... April 74

**DAWSON, D. D., JR.**
Bentonite-Diesel Oil Squeeze .. ..... Oct. 222

**DE LA ROCHE, ALBERT RUSCHIL**
Cuban Exploration Travels South ..... June 243

**DEVLIN, ROGER V.**
If 'The Bomb' Strikes . . . Tulsa Plant Is Ready ..... May 78

# AUTHOR INDEX—Continued


**DODS, I. W.**
Transco Uses Jets to Lower Hudson Crossing 15-20 Feet....Sept. 246-A

**DOUGHERTY, R. P.**
How Dehydrators Fight Internal Pipe Corrosion....April 248-H

**DOUGHERTY, TOM**
Drilling Problems in the Williston Basin....April 148

**DOUGLAS, BURKE**
Here's a New Development in Corrosion Protection...June 232-B

**DUDLEY, RAY L.**
Excessive Gasoline Stocks Likely....Jan. 44
Will the Growth of Middle East Oil Revive International Compact Talk?....Feb. 15 80
Attending the Exposition?....March 37
General Crude Price Increase Unlikely....March 40
Our Time-Saver Catches on....April 39
Economic Picture Brightens....May 98
Reduced Crude Stocks Desirable....June 64
Why Do They Call It That?....July 61
High Supply Endangers New Prices....July 84
Excessive Supply Darkens Outlook....Aug. 1 80
Gasoline Stocks Are Too High....Sept. 96
Output Must Be Curtailed....Oct. 116
Have You Noticed It?....Nov. 59
Economic Position Improves....Nov. 82
Economic Position Can Be Improved....Dec. 80

**DUNLOP, ROBERT G.**
Sinews of Industry....April 52

**E**

**EARLOUGHER, R. C.**
How to Estimate Water Requirements....Sept. 214

**EBELING, HAROLD O.**
How Condensate Recovery Increased....Aug. 1 176

**EBY, DR. J. BRIAN**
Morocco—A Country on the Threshold of Greater Wealth....Feb. 1 235

**ECKARD, WILLIAM E.**
How to Find a Field for Underground Natural Gas Storage....April 264-B

**ECKHARDT, E. A., DR.**
Geophysical Activity Reaches All-Time High in 1952.April 82

**EDMUNDS, F. H.**
Will Saskatchewan Discover Its Own Leduc?....Dec. 270

**EGAN, E. F.**
Hole Diameter Influences Neutron Derived Porosity...Jan. 172

**ELLISTON, H. H.**
How to Design a Radical Flow Settling Basin....March 182

**ENGLE, C. J.**
Filter Press Control Facilitates Lab Scheduling....Nov. 151

**ERDMAN, DONALD C.**
Using Ultrasound to Find Internal Pipe Corrosion..Aug. 1 210-R

**ERWIN, R. W. (WOODY)**
New Vacuum-Type Degasser Reduces Deep Drilling Hazards....June 125

**EVJEN, H. M.**
Surface Electrical Method Detects Oil Directly....Feb. 1 93

**F**

**FARMILO, A. W.**
Lower Cretaceous in Alberta and Saskatchewan....Dec. 282

**FARR, A. P.**
Vulnerability of Drill Pipe to Corrosion Fatigue....Oct. 200

**FERGUSON, LAWRENCE E.**
Rig Modernization Will Improve....Sept. 158

**FILSON, ROGER C.**
How to Reduce Lease Operating Expenses....Feb. 1 60

**FLANDERS, GEORGE S.**
Inverted-Type Packer Solves Salt Water Injection Problem....Jan. 186

**FORK, CHARLES H.**
Applying Graphical Methods to Square Footing Designs....May 254-D
Design of Rectangular Footings....June 214-F

**FRANK, A. R.**
Shop-Made Rig Speeds Operations....Jan. 131

**FREDHOLD, ALLAN**
How to Select and Install Braking Equipment for Your Drawworks....Jan. 135

**FRIES, B. E.**
Radioactive Controls Pay Off....May 270-D

**FRISIUS, E. N.**
Oil Field Scale and Corrosion....June 191

**FULLER, R. E.**
New Trailer-Mounted Rig Saves Valuable Rig-Up Time....March 120

**FURBER, F. D.**
Fracturing Sandstones of the Illinois Basin....Aug. 1 192

**G**

**GALLY, S. K.**
Using Ultrasound to Find Internal Pipe Corrosion...Aug. 1 210-R

**GIBBON, ANTHONY**
Nowata Water Floods Use Modern Techniques....Feb. 1 178
Sinclair's Big-Inch Line on Stream....June 214-H
Hauling Problems....Sept. 181

**GIEZENTANNER, W. L.**
Vapor Phase Cooling Boosts Engine Efficiency....July 182

**GIVEN, ALICE L.**
Crude, Products and Gas Lines Planned in 1953....Feb. 15 238

**GLOVER, ROBERT H.**
Seismograph Pays Off in Kansas....Sept. 109

**GREEN, B. Q.**
How to Train Mud Engineers....Jan. 115

**GRIMES, WAYNE H.**
What Are the Possibilities in Beaver County, Oklahoma?....June 84

**H**

**HAGAN, W. W.**
Can Western Kentucky Become An Active Oil Producing Area?....March 93

**HALPINE, J. H.**
How Mechanical Agitators Rid Tanks of Sediment....July 220-H

**HAMAKER, REX G.**
Check Your Hydraulic System to Cut Your Drilling Costs....March 128

**HATFIELD, J. R.**
How to Pump Deep Dual Completions Alternately....Jan. 188

**HECK, WILLIAM A.**
Why Has the Raton Basin Been Ignored?....Oct. 180

**HICHENS, EDGAR R.**
Make Weather Work For You....July 220-T

**HIGHTOWER, CECIL L.**
You're Safer . . . On the Job!....Jan. 220-A

**HOCHHAUSEN, E.**
Gravity Injection Pays Dividends at Redwater....Dec. 173

**HOLIK, W. V.**
How Are Gas Turbines Doing?....Nov. 222-A

**HOOPMAN, H. D.**
Ohio's Slim Hole Rig Cuts Exploratory Drilling Costs.June 107

**HORNER, VICTOR**
Here Are Factors Affecting Drill Hole Conditions....July 144

**HOWARD, GEORGE**
New Multiple Fracturing Process....Jan. 159

**HOWELL, DR. B. F., JR.**
Electrical Conduction in Fluid-Saturated Rocks
(Part 1)....Feb. 1 113
(Part 2)....March 142

**HUFFMAN, WALTER E.**
Take a Look at Treating Oil Emulsions....Nov. 178

**HULL, D. E.**
Radioactive Controls Pay Off....May 270-D

**HUNTER, FRANK H.**
Dual Completions Pay Off in Illinois....March 163

**HUNTER, VERN H.**
Drilling Operations Continue The Year Round in Canada....May 160

**HUSS, CARL I.**
Pressure Testing Lines with Oil....Feb. 1 200-F
This Makes Pipe Cleaning Easier....May 254-A

**I**

**IMLE, JOHN F.**
Safety Starts at the Top....Nov. 95

**IRWIN, DR. ARTHUR B.**
New Grid System Drafter to Speed Up Exploration...Dec. 262

# AUTHOR INDEX—Continued


J

**JEFFREYS, E. G.**
Northwestern Florida . . . A New Oil Province?....Aug. 1 99

**JOHNSON, CURTIS H.**
Are We Using Our Freedom?.....April 73

**JOHNSON, W. R.**
Current Drilling Practices in West Texas
(Part 1) .....April 141
(Part 2) .....May 180

**JOHNSTON, DAVID R.**
Current Drilling Practices in West Texas
(Part 1) .....April 141
(Part 2) .....May 180

**JONES, DAN L.**
Legislative Outlook Is Favorable to Industry.....Feb. 15 88

**JONES, JENKIN LLOYD**
I Saw American Enterprise and Oil Helping Build a Nation.....March 242

**JONES, MARVIN R.**
Field Testing Can Prevent Flange Leaks.....May 201

**JORGENSEN, ROY C.**
Here's a New Development in Corrosion Protection...June 232-B

**JOSEPH, JAMES**
Br-r-r-rother, It's Cold Outside!.....April 286

**JURIN, M. N.**
Can Russia Produce 600 Million Barrels of Oil Annually by 1955?.....March 236

K

**KASTROP, J. E.**
Dual Completion Takes Two Full Size Tubing Strings .....Feb. 1 162
Artificial Lift Equipment for 21,342 Wells Is Forecast .....Feb. 15 181
Four-Way Perforating Aids Squeeze Cementing.....April 222
Magnolia Makes an Unusual Completion in Wilcox...June 176
Wire Line Methods Cut Workover Costs.....Aug. 1 165
Well Stimulation at North Cowden Pays.....Oct. 264
Water-Flood Restores Youth to Old West Texas Lease.Oct. 251

**KAVANAGH, B.**
Accessibility Surveys Cut Costs.....Dec. 93

**KLIEWER, DON**
Petroleum Prices to Remain Generally Stable.....Feb. 15 68
Politics Threaten World Oil Adequacy.....April 90
This Is Talara.....May 281
57 Million Pounds of Explosives.....June 45
Camp Life Is Fun.....July 241
World Crude Reserves.....Aug. 15 76

**KAYSER, PAUL**
Oil and Gas Stand Side by Side.....Aug. 1 68

**KEPLINGER, C. H.**
Unitization . . . And How It Works.....July 198

**KLEINMAN, B. M.**
Surge Protection of Motors.....Feb. 1 200-A

L

**LAGUKI, E. B.**
New Automatic Tank Battery.....April 195

**LAPP, P. A.**
This New Flowmeter Measures True Mass-Rate.....June 215

**LASKY, BERNARD H.**
Surface Minerals Reveal Michigan Structures.....Dec. 100

**LI, Y. T.**
This New Flowmeter Measures True Mass-Rate.....June 215

**LINBLAD, W. N.**
How to Suppress Air-Borne Pulsations.....Aug. 1 210-F

**LINDEMAN, FRANK, JR.**
What Management Expects of Engineers.....March 64

**LINGO, CHARLES A.**
The Landowner . . . Enemy or Friend?.....March 206-J

**LOGAN, L. J.**
Competition Is Becoming Stiffer.....Feb. 1 66
Petroleum Demand Is for 1 Percent More Crude...Feb. 15 54
New Reserves in 1952 Fall Far Short of 1951 Peak..April 66
What the Company Reports Show.....May 86
Offshore Development to Be Speeded Up.....June 53
FPC Policies Curtail Gas Supplies.....July 71
Oil to Be $44 Billion Industry This Year.....Aug. 1 58
Oil Use in the U. S. Continues to Climb.....Aug. 15 96
Production Is High in the Permian Basin.....Oct. 129
Imports a Growing Problem for U. S.....Nov. 60

**LONG, W. L. (LUKE)**
Running and Pulling Pipe Under Pressure.....Feb. 1 111

**LUBINSKI, ARTHUR**
How to Cut Costs in Crooked Hole Areas
(Part 1) .....July 136
(Part 2) .....Aug. 1 136
(Part 3) .....Sept. 172

M

**MADOLE, DUDLEY**
The Rig with 100 Hints.....May 147

**MAJOR, R. O. (JACK)**
Unique Filter System—Featured in Pilot Flood.....Oct. 272

**MANTOOTH, CLARENCE F.**
Osage County, Oklahoma.....June 247

**MARSHALL, J. LLOYD**
Australia Is Beating the Bushes for Oil.....April 282

**MAST, B. T.**
New Developments in Compressor Equipment.....Oct. 304-A

**MAYHEW, E. J.**
How San Juan Operators Are Solving Mud Problems.March 136

**MEADE, CAPT. R. H.**
Operation Alaska .....Jan. 239

**MELLEN, FREDERICK F.**
Mississippi's Black Warrior Basin Yields Gas Condensate .....June 77
Black Warrior Basin . . . The Geology Is Favorable..July 97

**MELLIES, N. J.**
Guess Work Is Removed in Flood Evaluations.....May 216

**MENZIE, D. E.**
How to Select the Best Decline Curve.....Dec. 180

**MERRIMAN, DONALD R.**
Buckeye System Designed for Easy Expansion.....Nov. 246

**MEYER, H. R.**
How to Maintain Electrical Equipment.....July 221

**MEYERS, R. D.**
Cutoff Technique Reduces Time Requirements 50%.Feb. 1 124

**MIDDLETON, W. A.**
New Automatic Tank Battery.....April 195

**MILLS, KENNETH N.**
How to Select a Subsurface Pump Plunger to Fit the Job.....May 224
Proper Gas Control in Pumping Wells.....Dec. 188

**MILSTEIN, MARK**
Improved Magnetic Method Can Avoid Drilling Failures .....Jan. 87

**MOORE, DR. CARL A.**
Mistakes Can Be Costly in Geologic Correlations.....July 109

**MOORE, STANLEY C.**
Vulnerability of Drill Pipe to Corrosion Fatigue.....Oct. 200

**MORGAN, T. D.**
Boron Compounds Used as Water-Flood Tracers.....April 214

**MORRIS, HAROLD G.**
Here's How Machines Measure Gas Volumes
(Part 1) .....March 206-A
(Part 2) .....April 264-E

**MUELLER, DR. ADELHEID**
How Micro-Organisms Can Aid Search for Oil.....March 95

**MURDOCH, J. B., JR.**
How to Cut Costs in Crooked Hole Areas.....Oct. 213

**MYERS, BARTON A.**
Tulsa Is Ready to House 25,000 Visitors to IPE....Feb. 15 295

Mc

**McELVANEY, EUGENE**
A Banker Looks at the Contracting Business.....Nov. 140
Management Important in Securing Loans.....Dec. 64

**McLAUGHLIN, PHILLIP L.**
Efficiency Keynotes Takeup Job.....Feb. 1 232-D
Luxury and Efficiency Afloat.....April 164
Bulk Mud Saves Crew Time . . . Holds Waste to a Minimum.....Aug. 1 126
Well Completion Costs Rise Sharply.....Sept. 84
What Are the Problems in the Delaware Basin?.....Dec. 152

**McMULLEN, J. J. COMDR.**
How a Free-Piston Engine Works.....July 220-A

N

**NAEHER, W. F.**
Here's How Machines Measure Gas Volumes
(Part 1) .....March 206-A
(Part 2) .....April 264-E

**NEATH, W. A.**
How to Estimate Water Requirements.....Sept. 214

# AUTHOR INDEX—Continued


**O**

**OLDSHUE, J. Y.**
Fluid Mixture Being Used to Mix Drilling Mud.....Sept. 150

**OLIVER, GORDON**
Be Safe Though Small.....Jan. 140

**OLSON, C. C.**
Subsurface Pressures Tell Story.....Feb. 1 155

**ORTLOFF, JOHN E.**
Cable Handling Device Includes New Features.....April 107

**P**

**PARKER, MARSHALL E.**
Pipe Line Corrosion and Cathodic Protection—
Part 1—Soil Resistivity Surveys.....Feb. 210
Part 2—Potential Surveys .....March 222-J
Part 3—Line Currents .....April 248-F
Part 4—Current Requirement Surveys.....May 270-H
Part 5—Rectifier System for Coated Lines.....June 232-F
Part 6—Ground Bed Design and Installation.....July 220-O
Part 7—Magnesium Anodes on Coated Lines.....Aug. 210-J
Part 8—Hot Spot Protection with Magnesium Anodes .....Sept. 246-S
Part 9—Stray Current Electrolysis.....Oct. 304-T
Part 10—Interference in Cathodic Protection Systems .....Nov. 222-T
Part 11—Operation and Maintenance of Cathodic Protection Systems.....Dec. 224-S

**PARSONS, E. D.**
Boron Compounds Used as Water-Flood Tracers.....April 214

**PAZDERNY, LEONARD C.**
Pre-Running Ignition System.....Nov. 222-K

**PENICK, DUDLEY C.**
How to Solve Problems in Gas Measurements.....Nov. 194

**PERKINS, J. A., JR.**
New Production Methods Seek More Efficiency at Lower Costs .....Feb. 15 217

**PLUMMER, HARRY CHAPIN**
Canadian Tankers Are Still Busy.....Nov. 278

**POETTMANN, FRED H.**
New Correlation Simplifies Pressure Gradient Calculation in Tubing.....June 161

**POHLY, RICHARD A.**
New Gravity Approach Aids Reef Interpretation.....May 116

**PRATT, R. B.**
New Oil-Finding Method Tested.....Nov. 98

**PREBBLE, F. E.**
Accessibility Surveys Cut Costs.....Dec. 93

**PRESCOTT, B. OSBORNE**
Subsurface Problems Are Easier to Solve.....Sept. 118

**PRIESMEYER, HENRY**
Use of Existing Tubing Cuts Workover Costs.....June 186

**PROPER, GENE**
Automatic Shutdown Device Developed for Main Line Block Valves.....May 254-J

**PUZIN, L. A.**
New Well Logging Developments.....Dec. 134

**R**

**RAMSEY, ROBERT P.**
How a Free-Piston Engine Works.....July 220-A

**RANKIN, DAN R.**
What Is "NPSH"?.....Aug. 1 210-N
It's Easy to Determine NPSH.....Sept. 246-L

**RASSMUSS, DR. JUAN E.**
Peru Perks Up.....April 275
There's Oil in Peru's Montana.....May 288
Nature Makes it Tough.....Sept. 272

**REESE, AL**
Pipe Line Portrait—H. H. Anderson.....Jan. 218
Compensation Laws Under Fire.....Feb. 1 55
Pipe Line Portrait—Ralph B. McLaughlin.....April 264-A
Pipe Line Portrait—Joseph H. Russell.....May 270-J
When the Big Winds Blow.....June 48
International Fireman—M. M. Kinley.....July 63
How Much Authority Should Safety Directors Have?.Aug. 1 60
M. M. Kinley, International Fireman (Part 2).....Aug. 1 63
World Completions and Footage.....Aug. 15 61
Try Barbecues and Bonuses.....Sept. 170
They Fight Their Neighbors' Fires.....Oct. 304-E
The Air-Conditioned Roughnecks of Breton Sound....Oct. 323
Why They Don't Get Hurt on Old Rig 25.....Nov. 66
The Man Who Wasn't Blown Up.....Dec. 68
How Are Your *Press* Relations?.....Dec. 58

**REISS, ROYAL W.**
Dual Completion Takes Two Full Size Tubing Strings .....Feb. 1 162
Triple Completion Takes Three Tubing Strings.....Nov. 169

**REYBURN, H. O.**
You Can Save Money on Taxes.....Jan. 64

**RHOADS, B. J. (DUSTY), JR.**
Why Worry About Port Size in Gas Lift Valves?.....Nov. 187

**RICE, I. M.**
Gravity Injection Pays Dividends at Redwater.....Dec. 173

**RICE, DR. R. B.**
New Seismic Computing Method Fast and Efficient..Aug.1 93

**RICHARDS, WALTER C.**
How to Select Correct Sling for a Job.....Aug. 1 121

**RIGGS, C. H.**
Healdton Has Big Waterflood Potential.....July 190

**RIZZONE, M. L.**
Power Transmission on Modern Rotary Rigs
(Part 1) .....Nov. 128
(Part 2) .....Dec. 124

**ROBERTS, C. C.**
Simultaneous Log of Radioactivity Curves Cuts Standby Time in Half.....Jan. 122

**ROBINSON, MYRON L.**
You Can Analyze Gas in the Field.....Sept. 247

**ROSU, G. G.**
Austrian Oil a Victim of Tensions.....Jan. 242

**RUSSELL, J. H., JR.**
Interpretation of Dynamometer Cards.....July 175

**RYAN, JOHN**
Truncation-Type Traps Offer a New Horizon.....Oct. 177

**S**

**SCHWARTZ, DR. WILHELM**
How Micro-Organisms Can Aid Search for Oil.....March 95

**SCOTT, FLOYD, JR.**
Mud-Stuck Tubing Recovered by String-Shot Backoff Method .....April 200

**SCOTTY, C. B.**
Hole Diameter Influences Neutron Derived Porosity...Jan. 172

**SCRUGGS, CURTIS H.**
New Electronic Control System.....Sept. 246-V

**SHALLENBERGER, LAWRENCE K.**
What About Compressed Air?.....April 155

**SHEPHERD, D. L.**
Capitalization of Exploration Expenses
(Part 1) .....April 112
(Part 2) .....May 126

**SHIELS, BOB**
Automatic Pump Station Eliminates Looping Need..March 222-H
New Canadian Map Shows Trail's End.....Oct. 331

**SKINNER, HUBERT**
Electronics Speeds Gas Volume Calculations.....March 186

**SPANN, ROBERT E.**
Will the Growth of Middle East Oil Revive International Compact Talk?.....Feb. 15 80
Imports vs. American Control of Oil Resources.....May 84
When the Big Winds Blow.....June 48
Middle East Prices Up . . . Why?.....Aug. 1 62
World Supply and Demand.....Aug. 15 59
New Problems Arise in Iran.....Oct. 94
Watch the Middle East.....Nov. 70

**SMITH, CECIL W.**
Exploration Record Continues Upward Trend.....Feb. 15 93
Drilling Forecast Is For 46,988 New Wells.....Feb. 15 129
Exploratory Drilling off to a Fast Start.....March 98
Exploratory Drilling Remains Well Ahead of 1952 Pace .....April 120
Completions Up, But Drilling Falling Behind 1952 Pace.....May 102
Exploratory Drilling Continues Record-Breaking Pace for Year.....May 130
Increase in Activity Sends Exploratory Completions Up .....June 97
Upswing Continues, 1010 Tests in May.....July 116
Exploratory Drilling Reaches New Peak at Mid-Year Mark .....Aug. 1 108
U. S. Drilling Record Forecast in 1953.....Aug. 15 102
Rising Costs and Lower Revenue Rates.....Sept. 76
Vast Pipe Line Network Serves the Permian Basin....Oct. 154
Exploratory Drilling Pace Continues High in September.....Nov. 106
Drilling Rates Remain High.....Dec. 109

# AUTHOR INDEX—Continued


**SMITH, S. S.**
Progress in Products Pipe Lines....Feb. 1 201
This New Type Control Instrument....June 214-A

**STEAD, FREDERICK L.**
Delaware Basin May Be Next Major Oil Province....Oct. 142

**STEELE, J. M.**
Well Points Whip Quicksand....March 206-D

**STEPP, E. G.**
What About Gas Turbines?....Nov. 222-D

**STEWART, E. O.**
Use of Existing Tubing Cuts Workover Costs....June 186

**STRIDER, H. L.**
Here's How to Correct Your Mud Contamination....May 170

**SVEEN, LLOYD W.**
How They're Whipping Williston's Winter....Feb. 1 120

**SWIFT, GILBERT**
Simultaneous Log of Radioactivity Curves Cuts Standby Time in Half....Jan. 122

T

**TASMAN, CEVAT E.**
The Door's Open in Turkey....March 233

**TAYLOR, DONALD M.**
New Code for Gas System Piping Is on the Way....Jan. 210
U. S. Pipe Lines to Have 13,910 Added Miles....Feb. 235
The Rock Spread....April 248-A
Mobile Units Now Being Used for Dehydration Plant Repairs....May 255
North America's Largest Crude Oil Line Is Now in Operation....May 256
The U. S.'s Most Powerful Crude Oil Line Pump Station....May 258
United Gas System Serves "The Gulf South"....May 264
How the World's Deepest Submarine Line Was Laid..Sept. 246-H
How They Crossed the Straits of Mackinac....Oct. 304-H
Crisis Every 30 Minutes....Nov. 115
Save $20 Per HP on Station Costs....Nov. 230

**TAYLOR, M. R.**
'Weathered-In' Lease Problem Being Whipped....Dec. 276

**TEISSLER, R. B.**
Workovers Revive California Field....March 174

**THOMPSON, A. W.**
Completion Time Cut by Drilling Progress....Oct. 163

**THOMPSON, E. CONWAY**
How Electric Valve Operators Work....Nov. 222-R

**TOMLINS, EARLE E.**
Income Tax Encourages Oil Payments....March 55

**TOMLINSON, DR. C. W.**
Odd Geologic Structures of Southern Oklahoma....Jan. 90

U

**USSERY, J. T.**
How to Set Up a Materials Control System....Aug. 1 128
Materials Control Can Save You Money....Dec. 198

W

**WANENMACHER, J. M.**
Unitization . . . And How It Works....July 198

**WARN, FREDERICK G.**
Spraberry Structural Conditions
(Part 1)....March 83
(Part 2)....April 100

**WATSON, JAMES C**
West Texas Discoveries Reach Peak....Oct. 131

**WAY, JOHN E.**
Healdton Has Big Waterflood Potential....July 190

**WELSH, K. R.**
Safety Saves Money....Feb. 1 140

**WHEELER, HENRY P., JR.**
How to Find a Field of Underground Natural Gas Storage....April 264-B

**WHITE, LT. COL. FOSTER L.**
Casing Can Be Cemented in Permafrost Area....Dec. 119

**WICHERSHAM, PRICE D.**
Network Computations Solved 8 Times as Fast....Nov. 238

**WILLIAMS, ARTHUR R.**
New Wash Tank Design
(Part 1)....Sept. 203
(Part 2)....Oct. 278

**WILLIAMS, E. L.**
Job Talk Promotes Safety . . . by Pinpointing Hazards..June 118

**WILLIAMS, DR. O. B.**
Little Bugs—Big Problems....June 170

**WILLIAMSON, T. D., JR.**
How to Choose a Pig....June 232-I

**WILLIS, MARSHALL B.**
El Paso Natural Completes a Circle of Communication..Jan. 203

**WILSON, FRANKLIN G.**
Let's Talk About Safety!....March 60

**WILSON, GILBERT M.**
Tests Prove Discovery at Sturgeon Lake....Feb. 1 246
Canadian D3 Play Is Developing Fast....May 286
Canada....Aug. 15 108
1953 A Fruitful Year for Canada....Dec. 253

**WILSON, J. C.**
Fracturing Sandstones of the Illinois Basin....Aug. 1 192

**WOFFORD, DENVER**
Avoid Core Barrel Trouble....July 156

**WOODS, H. B.**
How to Cut Costs in Crooked Hole Areas
(Part 1)....July 136
(Part 2)....Aug. 1 136
(Part 3)....Sept. 172

Z

**ZONDAG, DR. CORNELIUS H.**
Global Oil and Trouble Grow Together
(Part 1)....Jan. 237
(Part 2)....Feb. 1 230
Peru . . . Modern-Day Trail Blazer....Nov. 275


## SPECIAL ISSUES

**Review-Forecast**....Feb. 15
**Exploration**....April
**Exposition**....May
**International Operations**....Aug. 15
**Drilling Contractors'**....Sept.
**West Texas-New Mexico**....Oct.
**Pipe Line**....Nov.
**Canadian**....Dec.

# SUBJECT INDEX
# WORLD OIL

**January-December Issues 1953**

**Volume 136 No. 1 through Volume 137 No. 7**


| | Page |
|---|---|
| Changing Panorama | 7 |
| Drilling Articles | 7 |
| Drilling Hints | 10 |
| Economic, Statistical and Market Articles | 10 |
| Editorials | 11 |
| Employee Relations, Training and Safety Articles | 11 |
| Exploration Articles | 12 |
| General Articles | 13 |
| International News, Feature and Statistical Articles | 14 |
| News Analysis | 13 |
| Pipe Line Articles | 15 |
| Pipe Line Hints | 18 |
| Production Articles | 18 |
| Production Hints | 19 |


## THE CHANGING PANORAMA


Demand for Government Bonds Is Due to Increase....Jan. 43
Industry Helps Relieve Shortages....Jan. 43
Mid-Continent Oil Operators Favor Aggressive Program.Feb. 1 39
Texas Asks Importers' Estimates for '53....Feb. 1 39
Tideland Snag?....Feb. 1 39
Changes Proposed in Social Security....March 39
Mounting Insurance Rates Under Fire....March 39
Oil Companies Can Strike a Blow for Free Enterprise....April 41
Steady Prices Refute Monopoly Charges....April 41
Suit on Scurry....April 41
Texas Compensation Insurance Bill Survives Early Attacks....April 60
What Our Readers Say About Middle-East Oil....April 61
Continental Shelf Could Be a Major Source for U. S. Oil..April 64
Is the FPC Ready for a Change of Heart Toward Business?....May 94
The Spirit of '76 at Work Again....June 60
There'll Be Some Changes at FTC....June 60
Kuykendall OK by the Oil Industry....June 60
Learning Gets a Big Lift....June 60
Record Pipe Line Program Foreseen....June 60
Arabian American Is World's Largest Oil Producing Co...July 80
Pipe Line for Coal Is in the Offing....July 80
Middle-East Gets a Shot in the Arm....July 80
API for Europe Is Asked by Dwyer....July 80
OW's Wanted....July 80
Automatic Controls Are Increasing Efficiency in Oil Industry....Aug. 1 76
You Can Help Cut Federal Spending....Aug. 1 76
New LPG Market....Aug. 1 76
New Refining Process Draws Interest....Sept. 92
Increase Needed....Sept. 92
Better Roads, Fewer Traffic Accidents Help Industry....Oct. 112
U. S. Disposing of Business Holdings....Oct. 112
Federal Government Urged to Quit Hoarding Public Lands.Nov. 78
Who Really Pays Corporation Taxes?....Nov. 78
The Farmers' Problems Are Oil Industry Problems, Too...Dec. 76
Will Demand Outstrip Imports by 1960?....Dec. 76


## DRILLING ARTICLES


**Acidizing**

Compressed Gas Cuts Carthage Acidizing Costs....Aug. 1 180
P. S. Clinkenbeard
Well Stimulation at North Cowden Pays....Oct. 264
J. E. Kastrop

**Air Drilling—Also See Gas Drilling**

What About Compressed Air?....April 155
Lawrence K. Shallenberger
Aeration of Drilling Fluids . . . A Solution to Lost Circulation?....Sept. 145
Roy A. Bobo and H. M. (Bill) Barrett

**Banking**

A Banker Looks at the Contracting Business....Nov. 140
Eugene McElvaney

**Barge—See Offshore**

**Bits**

Current Drilling Practices in West Texas
(Part 1)....April 141
(Part 2)....May 180
David Johnston and W. R. Johnston
Completion Time Cut by Drilling Progress....Oct. 163
A. W. Thompson

**Blowout Control—See Degasser**

**Boilers**

Closed Steam System on Drilling Rigs Cuts Boiler Maintenance, Fuel Needs....Jan. 132
George L. Daggs

**Braking Equipment—Drawworks**

How to Select and Install Braking Equipment for Your Drawworks....Jan. 135
Allan Fredhold

**Casing**

How to Identify Casing in Mixed Strings....April 144

**Cementing**

Four-Way Perforating Aids Squeeze Cementing....April 222
J. E. Kastrop
Casing Can Be Cemented in Permafrost Area....Dec. 119
Lt. Col. Foster L. White, USAF

**Completion Practices**

Dual Completion Takes Two Full Size Tubing Strings...Feb. 1 162
Royal W. Reiss and J. E. Kastrop
Dual Completions Pay Off in Illinois....March 163
Frank H. Hunter
Magnolia Makes an Unusual Completion in Wilcox....June 176
J. E. Kastrop
Triple Completion Takes Three Tubing Strings....Nov. 169
Royal W. Reiss

**Completions Rates—See "Drilling Activity"**

**Contractor Credit**

A Banker Looks at the Contracting Business....Nov. 140
Eugene McElvaney

**Core Barrel**

Avoid Core Barrel Trouble....July 156
Denver Wofford

# DRILLING ARTICLES—Continued


**Corrosion**
Vulnerability of Drill Pipe to Corrosion Fatigue.....Oct. 200
Stanley C. Moore and A. P. Farr

**Crooked Hole**
How to Cut Costs in Crooked Hole Areas
(Part 1) .....July 135
(Part 2) .....Aug. 1 136
(Part 3) .....Sept. 172
Arthur Lubinski and H. B. Woods
How to Cut Costs in Crooked Hole Areas.....Oct. 213
J. B. Murdoch, Jr. and Wesley Moore

**Deep Drilling**
Compounded Power Pumps Speed Drilling.....March 111

**Degasser**
New Vacuum-Type Degasser Reduces Deep Drilling Hazards .....June 125
R. W. (Woody) Erwin

**Depth**
Drilling Depth Records Set in Ten Areas.....Feb. 15 146

**Derrickman**
Heated Shelter Will Protect Derrick Men.....April 180
Derrickman's Sky Hook.....July 152

**Directional Drilling**
Do You Have a Problem of Directional Drilling?.....July 129
W. H. Cook

**Dogleg—See Crooked Hole**

**Drill Collar**
Cut Costs in Crooked Hole Areas
(Part 1) .....July 135
(Part 2) .....Aug. 1 136
(Part 3) .....Sept. 172
Arthur Lubinski and H. B. Woods
How to Cut Costs in Crooked Hole Area.....Oct. 213
J. B. Murdock, Jr., and Wesley Moore
Check Your Hydraulic System to Cut Your Drilling Costs.March 128
Rex G. Hamaker
Rubber Stabilizers are Solving Permain Problems.....Oct. 195
William S. Bachman

**Drill Pipe**
Vulnerability of Drill Pipe to Corrosion Fatigue.....Oct. 200
Stanley C. Moore and A. P. Farr

**Drilling Activity**
Completions in November Drop Sharply to 3704.....Jan. 54
1952 Footage Sets Record, Completions Near Peak.....Feb. 1 48
Rigs in Operation Gain Despite Steel Strike.....Feb. 15 140
Drilling Forecast is for 46,988 New Wells.....Feb. 15 129
Warren L. Baker and Cecil W. Smith
Wells Drilled 82.5 Percent by Rotary Method.....Feb. 15 144
Wells Completed 77.4 Percent Owned by Smaller Firms.Feb. 15 144
Drilling Depth Record Set in Ten Areas.....Feb. 15 146
Rig Ownership 85.2 Percent with Contractors.....Feb. 15 145
Completions and Footage Emphasize Deeper Drilling...Feb. 15 132
Contract Drilling Accounts for 91 Percent of U. S. Wells.Feb. 15 142
January Completions Up; Shallow Drilling Active.....March 50
Drilling Takes Usual Drop, But Completions Still High..April 50
Completions Up, But Drilling Falling Behind 1952 Pace...May 102
Cecil Smith
4210 Wells Make May Most Active Month of the Year....July 94
23,304 Completions at Mid-Year Tops Record 23,096 Set in '52.....Aug. 1 90
Record U. S. Drilling Rates Necessary.....Sept. 74
Record Drilling Tempo Maintained; 27,415 Wells Finaled in 7 Months.....Sept. 106
New Completions Record.....Oct. 126
Basin Has 12 Percent of U. S. Rigs.....Oct. 155
New Mexico Drilling Still Active.....Oct. 156
Keith Anderson
Completions Decline .....Nov. 92

**Drilling Contractor**
Contract Drilling Accounts for 91 Percent of U. S. Wells.Feb. 15 142
Rig Ownership 85.2 Percent with Contractors.....Feb. 15 145
Contract Drilling Highly Competitive.....Sept. 78
Warren L. Baker
What the Operator Wants from a Drilling Contractor.....Sept. 80
A. E. Chester

**Drilling Costs**
Drilling Costs Too High (Editorial).....Feb. 15 42
Warren L. Baker
Drilling Costs Can Be Cut (Editorial).....June 41
Warren L. Baker
Drilling Costs Slow Discovery Rate (Editorial).....Sept. 73
Warren L. Baker
Drilling Costs Slow Discovery Rate.....Sept. 73
Warren L. Baker
Rising Costs and Lower Revenue Rates.....Sept. 76
Cecil W. Smith
Well Completion Costs Rise Sharply.....Sept. 54
Philip L. McLaughlin

**Drilling Engineer—See Training**

**Drilling Platform—See Offshore**

**Drilling Practices**
How They're Whipping Williston's Winter.....Feb. 1 120
Lloyd W. Sveen
Running and Pulling Pipe Under Pressure.....Feb. 1 111
W. L. (Luke) Long
Compounded Power Pumps Speed Drilling.....March 111
How San Juan Operators Are Solving Mud Problems....March 136
E. J. Mayhew
Current Drilling Practices in West Texas
(Part 1) .....April 141
David Johnston and W. R. Johnston
Drilling Problems in the Williston Basin.....April 148
Tom Doughtery
Current Drilling Practices in West Texas.....May 180
David Johnston and W. R. Johnston
Drilling Operations Continue the Year Round in Canada...May 160
Vern H. Hunter
Ohio's Slim Hole Rig Cuts Exploratory Drilling Costs.....June 107
Gerald Burgess and H. D. Hoopman
Here are Factors Affecting Drill Hole Conditions.....July 144
Victor Horner
Completion Time Cut by Drilling Progress.....Oct. 163
A. W. Thompson
Rubber Stabilizers are Solving Permian Problems.....Oct. 195
William S. Bachman
Crisis Every 30 Minutes.....Nov. 115
Donald M. Taylor

**Dual Completions—See Completion Practice**

**Employee Relations**
Be Safe Though Small.....Jan. 140
Gordon Oliver
Job Talk Promotes Safety . . . By Pinpointing Hazards...June 118
E. L. Williams
Selling Safety . . . The Goal of the AAODC.....Sept. 168
H. W. Davidson
Try Barbecue and Bonuses.....Sept. 170
Al Reese

**Engines**
How to Maintain Correct Engine Temperatures.....March 114
A. J. Boyer
Maintenance Means Money in Your Pocket.....Sept. 156
Ralph F. Blair
Now's The Time to Winterize!.....Nov. 120
What Should be Done to Protect Engines?.....Nov. 122
John A. Boatman

**Feedwater Treater—See Boiler**

**Fire Extinguisher**
How to Make Fire Extinguisher from Propane Bottle.....July 134

**Fishing Tool**
New Nitrogen Impact Jar Eliminates Jarring Action....March 124

**Footage**
1952 Footage Sets Record, Completions Near Peak.....Feb. 1 48
Completions and Footage Emphasize Deeper Drilling...Feb. 15 132

**Gas Drilling**
Crisis Every 30 Minutes.....Nov. 115
Donald M. Taylor

**General**
Shop-Made Rig Speeds Operations.....Jan. 131
A. R. Frank
New Trailer-Mounted Rig Saves Valuable Rig-Up Time..March 120
R. E. Fuller
Here's How to Rig a Unitized Trap.....April 174
W. L. Broussard
The Rig With 100 Hints.....May 147
Dudley Madole
Skid Eliminates Wear on Equipment.....May 198
They're Overcoming Drilling Problems in Saudi Arabia..Aug. 1 146
L. C. Carson
Maintenance Means Money in Your Pocket.....Sept. 156
Ralph F. Blair
Rig Modernization Will Improve . . . .....Sept. 158
Laurence E. Ferguson
Unitized Sections Make Rig Winterizing Easier.....Nov. 152
Pullback Device Making Derrickman's Job Easier.....Dec. 144
What Are the Problems in the Delaware Basin?.....Dec. 152
Philip L. McLaughlin

**Hauling**
Hauling Problems .....Sept. 181
Anthony Gibbon

**Heater—See Rig Winterization**

**Hydraulic System**
Check Your Hydraulic System to Cut Your Drilling Costs.March 128
Rex G. Hamaker

**Jar—See Fishing Tool**

**Logging**
Simultaneous Log of Radioactivity Curves Cuts Standby Time in Half.....Jan. 122
Gilbert Swift and C. C. Roberts
Electrical Conduction in Fluid-Saturated Rocks.....Feb. 1 113
Dr. B. F. Howell, Jr.
Electrical Conduction in Fluid-Saturated Rocks.....March 142
Dr. B. F. Howell, Jr.
Vacuum Method Detects Gas-Bearing Formations.....Oct. 218
Jack E. Bliss
New Well Logging Developments
(Part 1) .....Dec. 134
L. A. Puzin

# DRILLING ARTICLES—Continued


**Lost Circulation**
Lost Circulation Can Be Avoided or Minimized.....May 150
J. M. Bugbee
New Vacuum-Type Degasser Reduces
Deep Drilling Hazards.....June 125
R. W. (Woody) Erwin
Procedures To Be Used in Fighting Lost Circulation.....June 132
J. M. Bugbee
They're Overcoming Drilling Problems.....Aug. 1 146
L. C. Carson
Aeration of Drilling Fluids . . . A Solution
to Lost Circulation?.....Sept. 145
Roy A. Bobo and H. M. (Bill) Barrett
Bentonite-Diesel Oil Squeeze.....Oct. 222
D. D. Dawson, Jr.
Crisis Every 30 Minutes.....Nov. 115
Donald M. Taylor

**Maintenance**
How to Maintain Correct Engine Temperatures.....March 114
A. J. Boyer
Avoid Core Barrel Trouble.....July 156
Denver Wofford
Maintenance Means Money in Your Pocket.....Sept. 156
Ralph F. Blair
Rig Modernization Will Improve.....Sept. 156
Laurence E. Ferguson
What Should Be Done To Protect Engines?.....Nov. 122
John A. Boatman

**Maintenance of Equipment (Monthly Graphic Feature)**
'Green' Bit Care.....Jan. 130
Radiator Care.....Feb. 1 118
V-Belt Care.....March 134
Drill Pipe and Casing Care.....April 162
Care of Blowout Preventer Lines.....May 178
Suction Hole Care.....June 144
How to Handle Boxed Supplies.....July 154
Sand Line Spooling Care.....Aug. 134
Mud Suction Line Care.....Sept. 165
Blowout Preventer Care.....Oct. 210
Wire Line Care.....Nov. 138

**Marine—See Offshore**

**Material Controls**
How to Set Up a Materials Control System.....Aug. 1 128
J. T. Ussery

**Mixed Strings—See Casing**

**Mixers**
Fluid Mixers Being Used to Mix Drilling Mud.....Sept. 150
J. Y. Oldshue

**Mud—General**
How to Train Mud Engineers.....Jan. 115
Fred Chisholm and B. Q. Green
Planning Cuts Mud Costs.....Feb. 1 134
Frank S. Bell
How to Train Mud Engineers
(Part 2).....Feb. 1 125
Fred Chisholm and B. Q. Green
How San Juan Operators are Solving Mud Problems....March 136
E. J. Mayhew
Here's How to Rig a Unitized Trap.....April 174
W. L. Broussard
Here's How to Correct Your Mud Contamination.....May 170
H. L. Strider
Here's How to Pull A Dry Pipe—And Save Money.....May 186
New Vacuum-Type Degasser Reduces
Deep Drilling Hazards.....June 125
R. W. (Woody) Erwin
Here are Factors Affecting Drill Hole Conditions.....July 144
Victor Horner
Bulk Mud Saves Crew Time . . . Holds Waste
To a Minimum.....Aug. 1 126
Philip L. McLaughlin
Aeration of Drilling Fluids . . . A Solution
to Lost Circulation?.....Sept. 145
Roy A. Bobo and H. M. (Bill) Barrett
Fluid Mixers Being Used to Mix Drilling Mud.....Sept. 150
J. Y. Oldshue
Bentonite-Diesel Oil Squeeze.....Oct. 222
D. D. Dawson, Jr.
Filter Press Control Facilitates Lab Scheduling.....Nov. 151
C. J. Engle and W. E. Bergman

**Mud Systems—See Mud**

**Offshore**
Luxury and Efficiency Afloat.....April 164
Philip L. McLaughlin
Is This the Answer to Offshore Operations?.....June 116
Talking Drilling Barges into Position . . . .....Nov. 136

**Perforating**
Four-Way Perforating Aids Squeeze Cementing.....April 222
J. E. Kastrop

**Power Transmission—See Rotary Drives**

**Preheater—See Boiler**

**Pumps—Mud**
Compounded Power Pumps Speed Drilling.....March 111

**Radar**
Talking Drilling Barges into Position . . . .....Nov. 136

**Rig Modernization**
Rig Modernization Will Improve . . . .....Sept. 158
Laurence E. Ferguson

**Rig Ownership**
Rig Ownership 85.2 Percent with Contractors.....Feb. 15 145

**Rig Winterization**
How They're Whipping Williston's Winter.....Feb. 1 120
Lloyd W. Sveen
Portable Heater Can Serve Many Uses on Rig Floor.....March 140
Heated Shelter Will Protect Derrick Men.....April 180
Drilling Operations Continue the Year Round in Canada...May 160
Vern H. Hunter
Now's the Time to Winterize!.....Nov. 120
Unitized Sections Make Rig Winterizing Easier.....Nov. 152

**Rigs**
Shop-Made Rig Speeds Operations.....Jan. 131
A. R. Frank
New Trailer-Mounted Rig Saves Valuable Rig-Up Time..March 120
R. E. Fuller
The Rig With 100 Hints.....May 147
Dudley Madole

**Rotary Drives**
Power Transmission on Modern Rotary Rigs
(Part 1).....Nov. 128
(Part 2).....Dec. 124
M. L. Rizzone

**Safety**
Be Safe Though Small.....Jan. 140
Gordon Oliver
Field Testing Can Prevent Flange Leaks.....May 201
Marvin R. Jones and Frank N. Baldwin, Jr.
Job Talk Promotes Safety . . . by Pinpointing Hazards...June 118
E. L. Williams
How to Make Fire Extinguisher from Propane Bottle.....July 134
Selling Safety . . . The Goal of the AAODC.....Sept. 168
H. W. Davidson
Try Barbecues and Bonuses.....Sept. 170
Al Reese
How You Can Combat Hydrogen Sulfide Hazards.....Nov. 190
George Austin

**Slim Hole**
Ohio's Slim Hole Rig Cuts Exploratory Drilling Costs.....June 107
Gerald Burgess and H. D. Hoopman

**Slings—Also see Wire Rope**
How to Select Correct Sling for a Job.....Aug. 1 121
Walter C. Richards

**Snubbing Pipe**
Running and Pulling Pipe Under Pressure.....Feb. 1 111
W. L. (Luke) Long

**Stabilizers**
Rubber Stabilizers are Solving Permian Problems.....Oct. 195
William S. Bachman

**Steam System—See Boilers**

**Testing**
Vacuum Method Detects Gas-Bearing Formations.....Oct. 218
Jack E. Bliss
Filter Press Control Facilitates Lab Scheduling.....Nov. 151
C. J. Engle and W. E. Bergman

**Testing, Drill Stem**
Subsurface Pressures Tell the Story.....Feb. 1 155
C. C. Olsen

**Torque Converter—See Rotary Drives**

**Training—Personnel**
How to Train Mud Engineers
(Part 1).....Jan. 115
(Part 2).....Feb. 1 125
Fred Chisholm and B. Q. Green

**Transportation—See Hauling**

**Trucking—See Hauling**

**Well Surveying—See Logging**

**Wire Rope**
Cutoff Technique Reduces Time Requirements 50%.....Feb. 1 124
R. D. Meyers
How to Select Correct Sling for a Job.....Aug. 1 121
Walter C. Richards

**Workovers**
Workovers Revive California Field.....March 174
R. B. Teissier
Mud-Stuck Tubing Recovered by String-Shot
Backoff Method.....April 200
Floyd Scott, Jr.
Use of Existing Tubing Cuts Workover Costs.....June 186
E. O. Stewart and Henry Priesmeyer

## DRILLING HINTS


Agitator Blends Mud Mixtures....Jan. 146
Tanks on Skids Moved Easily....Jan. 146
Mud Tank Has Service Line....Jan. 146
Rack Constructed of Oil Drill Pipe....Jan. 148
Unitized Controls Operate Devices....Jan. 148
Ramp Supports Portable Rig....Jan. 150
Exhaust Line Cuts Rig-Up Time....Jan. 152
This Counter-Weight Holds Finger Bars....Jan. 152
An Auxiliary Ramp Proves Multi-Purpose....Jan. 153
Permanent Electric Switchboard Practical....Jan. 153
Fire Box Mat Protected by Tray....Jan. 154
Mud Mixing Device Adjusts Flow Volume....Jan. 154
Portico Protects Magneto Ignition....Jan. 156
This Iron Stand Protects Swivel....Feb. 1 146
Hook Reduces Chain Hazards....Feb. 1 146
Doghouse Support is Collapsible....Feb. 1 146
Lifting Packoff Units Made Easier....Feb. 1 148
Flume Separates Cuttings, Fluid....Feb. 1 148
Handy Rack Holds Hand Tools....Feb. 1 148
Discarded Panel Used as Vise Base....Feb. 1 150
Davit Crane Lifts Pump Suction Hose....Feb. 1 150
Catwalks Relieve Doghouse Traffic....Feb. 1 151
Doghouse Built Over Change House....Feb. 1 151
Oil Drained Into Convenient Drum....Feb. 1 151
Pumps Use Same Discharge Line....Feb. 1 152
Hanger Devised for Wire Spool....Feb. 15 164
Sucker Rods Form Doghouse Steps....Feb. 15 164
Mud Gun Can be Directed Five Ways....Feb. 15 164
Carpet Sweeper is Forge Blower....Feb. 15 166
Wrist Pin Wrench Made of Steel Slap....Feb. 15 166
Simple Hook-Up Unitizes Mud Tank....Feb. 15 168
Suction Tank Provided with Flume....Feb. 15 168
Over the Rim Suction Piping is New....Feb. 15 172
Washdown Pump Run Off Flywheel....Feb. 15 172
Bail Facilitates Tool Box Handling....Feb. 15 174
Truck Rack Holds Arc Welding Cable....Feb. 15 174
Housed Radiator is Side-Mounted....Feb. 15 178
Light is Mounted on Derrick Floor....March 148
Skid Transports Christmas Trees....March 148
Rack Helps to Keep Rig Tidy....March 148
This Tool Dock Keeps Boxed Materials Dry....March 150
Skid-Mounted Tanks Facilitate Handling....March 150
U Bolt Eyelet is Useful in Hoisting....March 150
Tool Box on Skids is Durable....March 152
Hose Holder is Made of Bent Steel Rod....March 152
Vise on Steel Bench Ideal for Rugged Use....March 156
Standardizing Pump Flow Pays....March 158
Roof Protects Electric System....March 160
Tool Box Fits Under Drawworks....March 160
Tarpaulin Curtains are Durable....April 182
Doghouse Rest on Toolhouse....April 182
Holes are Cut in Trench Cover....April 182
Rack on Truck Keeps Tools Clean and Handy....April 184
Highline Post Made of Pipe is Sturdy....April 184
Wire Storage Spool Protects Excess Hose....April 186
Traffic Guides Used on Guyline Anchors....April 186
Compact Drum Rack Used on Drilling Rig....April 188
Cylindrical Toilet Built in Steel Unit....April 188
Chain-Come-Along Tightens Guy Wires....April 188
Walkway Folds Up Over Mud Ditch....April 192
Engine Roof is Hinged to Derrick....April 192
Bed Rail Pipe Rack is Demountable....May 188
Chain Gate is Trespass-Proof in Drilling Area....May 188
Storage Hook Protects Expensive Cat Rope....May 190
Steel Fram Groups Preventer Wheels....May 194
Rack is Safe Place for Washdown Hose....May 196
Skid Eliminates Wear on Equipment....May 198
Relief Line Connects Suction....June 146
Hinged Slot Gates Avert Deflection....June 146
Fenders Protect Pipe Rack Sections....June 156
Rotating Tool Box Conserves Space....June 158
Cut Outs on Low Pressure Pipe Lines Made Safely....June 234
Electricity Keeps Engines Warm....June 234
Light Pipe Skids Prevent Slipping....June 234
Hydraulic Clamp Aligns Casing....June 238
Portable Shacks are Economical....June 240
V-Block Speeds Pipe Fabrication....June 240
Walkways Direct Pump Room Traffic....June 240
Permitting Access to Equipment....July 160
Cooling Mud Suction Cuts Pump Repairs....July 160
Making Bucket Stand....July 160
Adjusting Belt Tension with Turnbuckle....July 162
Constructing Compact Header Manifold....July 162
Storing Catalogs....July 165
Speeding Workover Jobs....July 166
Sledding Over Mud....July 168
Lubricating Chains....July 168
Collapsing Rig Floor....July 170
Transporting Pipe....July 172
Mounting Spare Tires on Safe Removal....Aug. 1 152
Guiding Pipe on Ramp....Aug. 1 152
Prevent Boiler Damage....Aug. 1 152
Simplifying Mud Pump Piping....Aug. 1 154
Roofs Protect Pumps from Weather....Aug. 1 158
Saving Waste Mud....Aug. 1 158
Anchoring Pipe Tongs....Aug. 1 160
Baling Empty Bags....Aug. 1 160
Mounting Water Cooler....Aug. 1 161
Mounting Vise on Post....Aug. 1 161
Racking Fuel Oil Drums....Aug. 1 162
Rounding Tank Corners....Aug. 1 162
Hoisting Oil Storage Drums Safely....Sept. 184
Fishing by New Methods....Sept. 184
Making Vertical Ladder....Sept. 184
Protecting Tool Joints....Sept. 188
Making Motor Shelf....Sept. 188
Reeling Washdown Hose....Sept. 191
Preventing Tool Loss....Sept. 191
Expediting Grease Jobs....Sept. 191
Standing Drill Pipe....Sept. 195
Mounting Tape Holder....Sept. 195
Covering Shear Pins....Sept. 196
Breaking Out Nipples....Sept. 196
Increasing Leverage....Sept. 198
Drying Clothes....Sept. 198
Spooling Electric Cables....Oct. 238
Picking up Bits....Oct. 238
Moving Pipe Threader....Oct. 238
Supporting Ramp....Oct. 240
Mounting Rig Lights....Oct. 240
Transporting Bunk House....Oct. 240
Increasing Leverage....Oct. 244
Making Cooler Stand....Oct. 244
Moving Equipment on Skids....Oct. 246
Constructing Walkway....Oct. 246
Leveling Structures....Oct. 247
Attaching Muffler to Engine....Oct. 248
Regulating Suction Lines....Nov. 156
Combining Structures....Nov. 156
Moving Small Buildings....Nov. 158
Unitizing Generating Plant....Nov. 158
Installing Dump Valve....Nov. 158
Bypassing Shale Shaker....Nov. 160
Storing Lube Oil....Nov. 160
Installing Panel on Mud Tank....Nov. 162
Widening Bit Courses....Nov. 164
Supporting Weight....Nov. 164
Unitizing Water Well Pumps....Nov. 166
Mounting Filters....Nov. 166
Dumping Sand Through Downspouts....Dec. 158
Making Tool Box....Dec. 158
Winching Suction....Dec. 160
Hauling Whipstock....Dec. 160
Protecting Wire Line....Dec. 164
Splitting Bags....Dec. 164
Combining Fuel Tank....Dec. 166
Lighting Drilling Rig....Dec. 168
Erecting Pipe Rack....Dec. 168
Installing Dump Valve....Dec. 170


## ECONOMICAL, STATISTICAL AND MARKET ARTICLES


**Completions—See Drilling Activity**

**Consumption—See Demand**

**Demand**

More U. S. Crude Needed in '53....Feb. 1 50
Petroleum Demand Requires 1 Percent More Crude....Feb. 1 54
L. J. Logan
All Oils in U. S. Annually Since 1918....Feb. 15 54
Distillate Fuel in U. S. Annually Since 1932....Feb. 15 60
Motor Fuel in U. S. Annually Since 1918....Feb. 15 59
Residual Fuel Oil in U. S. Annually Since 1932....Feb. 15 60
World Supply and Demand....Aug. 15 59
Robert E. Spann
Oil Use in the U. S. Continues to Climb....Aug. 15 96
L. J. Logan

**Discoveries**

Oil, Gas and Distillate Discoveries by States in 1952....Feb. 15 96
Exploratory Drilling Remains High After Slight Decline..Jan. 100
Exploratory Drilling Sets New Record During 1952....Feb. 1 98
Exploration Record Continues Upward Trend....Feb. 15 93
Cecil W. Smith
Exploratory Drilling Off to a Fast Start....March 98
Cecil W. Smith
Exploratory Drilling Remains Well Ahead of 1952 Pace..April 120
Cecil W. Smith
Exploratory Drilling Continues Record-Breaking Pace for Year....May 130
Cecil W. Smith
U. S. Discoveries in March....May 132
Increase in Activity Sends Exploratory Completions Up...June 97
Cecil W. Smith
Upswing Continues, 1010 Tests in May....July 116
Cecil W. Smith
Exploratory Drilling Reaches New Peak at Mid-Year Mark....Aug. 1 108
Cecil W. Smith
Exploratory Well Completions Reach Year's Highest Point....Sept. 124
Exploratory Drilling Pace Continues High in September..Nov. 106
Cecil W. Smith
U. S. Discoveries in September....Nov. 108

**Drilling Activity**

U. S. Monthly Trends by States....Each Issue
Drilling Rigs in U. S. by Months Since 1938....Feb. 15 141
Drilling Rig Ownership....Feb. 15 145
Drilling Depth Records by States....Feb. 15 150
Footage Drilled Annually Since 1941....Feb. 15 133
Footage Drilled by States in 1952....Feb. 15 138
Average Depth per Well in U. S. Since 1941....Feb. 15 133
Average Depth per Well in U. S. by States During 1952..Feb. 15 138
Wells Drilled in U. S. Since 1859 by Years....Feb. 15 134
Wells Drilled in U. S. by States During 1952....Feb. 15 138
Forecast of Drilling Activity for 1953....Feb. 15 129
Warren L. Baker and Cecil W. Smith
World Completions and Footage....Aug. 15 61
Al Reese
U. S. Drilling Record Forecast in 1953....Aug. 15 102
Warren L. Baker and Cecil W. Smith
Record U. S. Drilling Rates Necessary....Sept. 74

# ECONOMICAL, STATISTICAL AND MARKET ARTICLES—Continued


Completions in November Drop Sharply to 3704.....Jan. 54
1952 Footage Sets Record, Completions Near Peak.....Feb. 1 48
January Completions Up; Shallow Drilling Active.....March 50
Drilling Takes Usual Drop; But Completions Still High...April 50
Completions Up, But Drilling Falling Behind 1952 Pace...May 102
Cecil W. Smith
Lead Piled Up in First Four Months is Shrinking.....June 74
4210 Wells Make May Most Active Month of the Year.....July 94
23,304 Completions at Mid-Year Tops Record
23,096 Set in '52.....Aug. 1 90
Record Drilling Tempo Maintained; 27,415 Wells
Finaled in 7 Months.....Sept. 106
New Completions Record.....Oct. 126
Completions Decline.....Nov. 92
Completions Bounce Back.....Dec. 90
Drilling Must Expand to Meet Demands, Baker Tells API.Dec. 84

**Drilling Costs**
Well Completion Costs Rise Sharply.....Sept. 84
Philip L. McLaughlin
Rising Costs and Lower Revenue Rates.....Sept. 76
Cecil W. Smith
Drilling Costs Slow Discovery Rate.....Sept. 73
Warren L. Baker

**Exploratory Drilling Activity**

**Exports-Imports**
Exports and Imports Margin to Widen Further.....Feb. 15 66
U. S. Exports and Imports Annually Since 1918.....Feb. 15 67
Exports from Various Countries in 1951 and 1952.....Feb. 15 262
Imports vs. American Control of Oil Resources.....May 84
Robert E. Spann
Imports a Growing Problem for U. S.....Nov. 60
L. J. Logan

**Imports—See Exports-Imports**

**Market Conditions and Outlook**
Excessive Gasoline Stocks Likely.....Jan. 44
Ray L. Dudley and Warren L. Baker
Reduced Crude Runs Needed.....Feb. 1 40
Stocks of Oils Too High in Three Categories.....Feb. 15 74
General Crude Price Increase Unlikely.....March 40
Ray L. Dudley and Warren L. Baker
Economic Picture Brightens.....May 98
Ray L. Dudley and Warren L. Baker
Reduced Crude Stocks Desirable.....June 64
Ray L. Dudley and Warren L. Baker
High Supply Endangers New Prices.....July 84
Ray L. Dudley and Warren L. Baker
Excessive Supply Darkens Outlook.....Aug. 1 80
Ray L. Dudley and Warren L. Baker
Gasoline Stocks are Too High.....Sept. 96
Ray L. Dudley and Warren L. Baker
Output Must Be Curtailed.....Oct. 116
Ray L. Dudley and Warren L. Baker
Economic Position Improves.....Nov. 82
Ray L. Dudley and Warren L. Baker
Economic Position Can Be Improved.....Dec. 80
Ray L. Dudley and Warren L. Baker
Will Demand Outstrip Imports by 1960?.....Dec. 76

**Natural Gas**
Marketed U. S. Natural Gas Production by States,
Annually Since 1906.....Feb. 15 199
Natural Gas Sales, Customers and Revenues in
1951 and 1952.....Feb. 15 196
Natural Gas Value of U. S. Marketed Production
Since 1906.....Feb. 15 199
Natural Gas Producing Wells Yearly Since 1918.....Feb. 15 194
Natural Gas Reserves in U. S.....Feb. 15 196
Natural Gas Wells Drilled in U. S.....Feb. 15 132

**Oil-Using Units**
Oil-Using Units Continue Rapid Growth.....Feb. 15 76

**Petroleum Trends in U. S.**
An illustrated, statistical monthly feature showing
trends by months in:
Crude Oil Production
Crude Runs to Stills
Crude Oil Stocks
Crude Imports
Distillate Fuel Production and Stocks
Gasoline Production and Stocks
Footage Drilled
Imports
Rigs Running
Residual Fuel Production and Stocks

**Pipe Line**
Pipe Line Mileage Laid in U. S. Annually by Type
Since 1939.....Feb. 15 235

**Prices**
Average U. S. Crude Oil Price at Well Annually
Since 1859.....Feb. 15 190
Average Gasoline Prices in 50 Cities Since 1918.....Feb. 15 69
Petroleum Prices to Remain Generally Stable.....Feb. 15 63
Don Kliewer
Better Use of Statistical Data.....Dec. 57
Warren L. Baker

**Producing Wells**
Forecast of U. S. Wells to go on Artificial Lift in 1953..Feb. 15 182
Artificial Lift Wells in U. S. by States at End
of 1951 and 1952.....Feb. 15 209
U. S. Producing Depth Record by States.....Feb. 15 205
Oil Wells Producing in U. S. Yearly Since 1918.....Feb. 15 208
Gas Wells Producing in U. S. Yearly Since 1918.....Feb. 15 194
World Producing Wells by Countries.....Aug. 15 78

**Production**
U. S. Natural Gas Production by States Annually
Since 1906.....Feb. 15 199
U. S. Annual Crude Oil Production by States
Since 1859.....Feb. 15 188-190
U. S. Annual and Daily Crude Oil Production Since 1918.Feb. 15 183
Marketed LPG Production in U. S., by Uses,
Annually Since 1922.....Feb. 15 214
Natural Gasoline Production in U. S., by Years
Since 1918.....Feb. 15 192
World Production by Countries, Annually Since 1857...Feb. 15 270
World Crude Production by Countries.....Aug. 15 63
U. S. Crude Production at New High.....Aug. 15 106

**Refining Activity**
Crude Runs to Stills in U. S. Annually Since 1918.....Feb. 15 210
Major Refined Product Output in U. S. During
1951 and 1952.....Feb. 15 211
World Refining Operations by Countries.....Aug. 15 80

**Report from Observatory (Monthly Feature)—See Market Conditions and Outlook**

**Reserves**
Crude Reserves in U. S. at End of Year Since 1900.....Feb. 15 202
Liquid Hydrocarbon Reserves in U. S. by States,
End of 1951.....Feb. 15 201
Natural Gas Reserves in U. S.....Feb. 15 195
New Reserves in 1952 Fall Far Short of 1951 Peak.....April 66
L. J. Logan
World Crude Reserves by Countries.....Aug. 15 76
Don Kliewer

**Stocks—See Market Conditions and Outlook**

**Tanker Fleet**

**Wells Drilled—See Drilling Activity**

**Wildcat Discoveries—See "Discoveries"**

**Wildcat Drilling—See "Exploratory Drilling Activity"**


# EDITORIALS


Good Things Ahead.....Jan. 41
Warren L. Baker
Higher California Prices Needed.....Feb. 1 37
Warren L. Baker
Drilling Costs Too High.....Feb. 15 49
Warren L. Baker
Attending the Exposition?.....March 37
Ray L. Dudley
Our Time-Saver Catches On.....April 39
Ray L. Dudley
Water-Flooding Like Wildcatting.....May 75
Warren L. Baker
Costs Can Be Cut.....June 41
Warren L. Baker
Why Do They Call It That?.....July 61
Ray L. Dudley
Picking on Oil Again.....Aug. 1 57
Warren L. Baker
Drilling Costs Slow Discovery Rate.....Sept. 73
Warren L. Baker
Cartel Suit Should Be Heard.....Oct. 93
Warren L. Baker
Have You Noticed It?.....Nov. 59
Ray L. Dudley
Better Use of Statistical Data.....Dec. 57
Warren L. Baker


# EMPLOYEE RELATIONS, TRAINING AND SAFETY ARTICLES


Let's Talk About Safety!.....March 60
Franklin G. Wilson
Industry Safety Record is the Best in History.....June 59
How Much Authority Should Safety Directors Have?...Aug. 1 60
Al Reese
Why They Don't Get Hurt on Old Rig 25.....Nov. 66
Al Reese
What Management Expects of Engineers.....March 64
Frank Lindeman, Jr.
How to Win Friends . . . and Help Students.....Sept. 83
How to Sell Ideas to Management.....Oct. 99
Prof. M. L. Powers
The Air-Conditioned Roughnecks of Breton Sound.....Oct. 323
Al Reese
How Are Your Press Relations?.....Dec. 58
Al Reese

# EXPLORATION, GEOLOGICAL AND GEOPHYSICAL ARTICLES


**Aerial Photography**

Accessibility Surveys (in Canada) Cut Costs.....Dec. 93
P. H. Blanchet, B. Kavanagh and F. E. Prebble

**Associations**

Three Exploration Societies Meet in Houston March 23-26 .....March 90
Exploration Societies Look to Future.....April 76
Audience Got the Point! (Beam of light used as pointer for slides at AAPG meeting.).....April 80
AAPG Moves into New Headquarters in Tulsa.....April 88

**Bacteria**

How Micro-Organisms Can Aid Search for Oil.....March 95
Dr. Wilhelm Schwartz and Dr. Adelheid Mueller

**Canada**

Interpretation of Seismic Data in Locating Reefs in Alberta .....Feb. 1 86
P. I. Bediz
Accessibility Surveys (in Canada) Cut Costs.....Dec. 93
P. H. Blanchet, B. Kavanaugh and F.E. Prebble

**Discoveries**

A monthly feature, appearing in each issue. Gives significant data on new fields, new pay horizons, and field extensions in U. S. Presented along with monthly statistical articles indexed below under the heading, "Exploratory Drilling Activity."

**Editorials Concerning Exploration**

Are We Using Our Freedoms? (Taking advantage of them in searching for petroleum.).....April 73
Curtis H. Johnson
The Petroleum Geologist (His Responsibilities and Opportunities.) .....April 74
Morgan J. Davis

**Electrical Methods**

Surface Electrical Method Detects Oil Directly.....Feb. 1 92
H. M. Evjen

**Exploratory Drilling Activity (Monthly Feature)**

Exploratory Drilling Remains High After Slight Decline..Jan. 100
Exploratory Drilling Sets New Record During 1952.....Feb. 1 98
Exploratory Drilling Off to a Fast Start.....March 98
Cecil W. Smith
Exploratory Drilling Remains Well Ahead of 1952 Pace..April 120
Cecil W. Smith
Exploratory Drilling Continues Record-Breaking Pace for Year .....May 130
Cecil W. Smith
Increase in Activity Sends Exploratory Completions Up..June 97
Cecil W. Smith
Upswing Continues, 1010 Tests in May.....July 116
Cecil W. Smith
Exploratory Drilling Reaches New Peak at Mid-Year Mark .....Aug. 1 108
Cecil W. Smith
Exploratory Well Completions Reach Year's Highest Point.Sept. 124
Exploratory Wells Being Completed at a Record Rate.....Oct. 186
Cecil W. Smith
Exploratory Drilling Pace Continues High in September...Nov. 106
Cecil W. Smith
Rates Remain High.....Dec. 109
Cecil W. Smith

**Exploratory Drilling Outlook (Annual Forecast)**

Prospecting Outlook Is for Accelerated Activity (Forecasts of Exploratory Drilling Activity, by Districts).....Feb. 15 101

**Florida**

Northwestern Florida . . . A New Oil Province?.....Aug. 1 99
E. G. Jeffreys

**Geophysical Crews**

Geophysical Crews Busy in Record Numbers.....Feb. 1 100
Geophysical Activity Reaches All-Time High in 1952.....April 82
Dr. E. A. Eckhardt

**Gravity Method**

New Gravity Approach Aids Reef Interpretation.....May 116
Richard A. Pohly

**Illinois Basin**

What Are the Opportunities in the Illinois Basin?.....May 111
William E. Brubeck

**Kentucky**

Can Western Kentucky Become An Active Oil Producing Area?.....March 93
W. W. Hagan

**Magnetic Methods**

Improved Magnetic Method Can Avoid Drilling Failures...Jan. 87
Mark Milstein

**Michigan**

Surface Minerals Reveal Michigan Structures.....Dec. 100
Bernard H. Lasky

**Mineralization Surveys**

Surface Minerals Reveal Michigan Structures.....Dec. 100
Bernard H. Lasky

**Mississippi**

Mississippi's Black Warrior Basin Yields Gas Condensate (Part 1 of a 2-part article).....June 77
Frederic F. Mellen
Black Warrior Basin—The Geology Is Favorable (Part 2 of a 2-part article).....July 97
Frederic F. Mellen

**Oklahoma**

Odd Geologic Structures of Southern Oklahoma.....Jan. 90
Dr. C. W. Tomlinson
Pennsylvania Cross Sections of Central Oklahoma.....Feb. 1 83
What Are the Possibilities in Beaver County, Oklahoma?.June 84
Wayne H. Grimes

**Paleontology**

Some Facts About Fossils.....Jan. 90
Foraminifera—An Evaluation.....April 75
Clifford C. Church

**Radio Method of Oil Exploration**

New Oil-Finding Method Tested.....Nov. 93
R. B. Pratt

**Raton Basin (New Mexico-Colorado)**

Why Has the Raton Basin Been Ignored?.....Oct. 180
William A. Heck

**Reefs**

Interpretation of Seismic Data in Locating Reefs in Alberta.....Feb. 1 86
P. I. Bediz
New Gravity Approach Aids Reef Interpretation.....May 116
Richard A. Pohly

**Safety**

Safety Starts at the Top (in Geophysical Work).....Nov. 95
John F. Imle

**Seismograph**

Interpretation of Seismic Data in Locating Reefs in Alberta.....Feb. 1 86
P. I. Bediz
Cable Handling Device Includes New Features.....April 107
John E. Ortloff
New Seismic Computing Method Fast and Efficient....Aug. 1 91
Dr. R. B. Rice
Seismograph Pays Off in Kansas.....Sept. 108
Robert H. Glover

**Slide Rule for Dip Problems**

Subsurface Problems Are Easier to Solve (with Specially Designed Slide Rule).....Sept. 113
B. Osborne Prescott

**Statistics (Exploratory Drilling)**

Exploration Record Continues Upward Trend (Annual Statistics) .....Feb. 15 93
Cecil W. Smith

**Subsurface Geologic Correlations**

Mistakes Can Be Costly in Geologic Correlations.....July 109
Dr. Carl A. Moore

**Taxes**

Capitalization of Exploration Expenses
(Part 1) .....April 113
(Part 2) .....May 126
D. L. Shepherd

**West Texas**

Spraberry Structural Conditions
(Part 1) .....March 81
(Part 2) .....April 100
G. Frederick Warn
Truncation-Type Traps Offer a New Horizon.....Oct. 177
John Ryan
Delaware Basin May Be Next Major Oil Province.....Oct. 143
Frederick L. Stead
West Texas Discoveries Reach Peak.....Oct. 131
James C. Watson

**Wildcat Discoveries—See "Discoveries"**

**Wildcat Drilling—See "Exploratory Drilling Activity"**

**World Reserves**

Politics Threaten World Oil Adequacy.....April 90
Warren L. Baker and Don Kliewer

# GENERAL ARTICLES


**Exposition**
Tulsa Is Ready to House 25,000 Visitors to IPE.....Feb. 15 295
Barton A. Myers
Tulsa Is Ready for the Oil Show.....May 81
This Is the Oil Show.....June 43

**Fires**
International Fireman—M. M. Kinley (Part 1).....July 63
Al Reese
M. M. Kinley, International Fireman (Part 2).....Aug. 1 63
Al Reese
The Man Who Wasn't Blown Up.....Dec. 68
Al Reese

**Gas**
Higher Taxes on Texas Gas Not Advisable.....May 76
FPC Policies Curtail Gas Supplies.....July 71
L. J. Logan
Oil and Gas Stand Side by Side.....Aug. 1 68
Paul Kayser
How to Determine Sites for Underground Storage.....Oct. 102
Harold S. Thomas

**General**
What's Ahead in '53?.....Jan. 59
How to Present Property Appraisal Data.....Jan. 68
R. I. Bradley
Compensation Laws Under Fire.....Feb. 1 55
Al Reese
How to Reduce Lease Operating Expenses.....Feb. 1 60
Roger C. Filson
Global Oil and Trouble Grow Together (Part 2).....Feb. 1 239
Dr. Cornelius Zondag
Competition Is Becoming Stiffer.....Feb. 1 66
L. J. Logan
Oil Vs. Politics.....Feb. 1 67
Max W. Ball
Legislative Outlook Is Favorable to Industry.....Feb. 15 88
L. Dan Jones
I Saw American Enterprise and Oil Helping Build a Nation.....March 242
Jenkin Lloyd Jones
Steel for Oil to Be Sufficient.....Feb. 15 77
Sinews of Industry.....April 52
Robert G. Dunlop
If 'The Bomb' Strikes . . . Tulsa Plant Is Ready.....May 78
Roger V. Devlin
What the Company Reports Show.....May 86
L. J. Logan
Osage County, Okla.....June 247
Clarence F. Mantooth
Camp Life Is Fun.....July 241
Don Kliewer
Nottinghamshire County, England.....Aug. 1 230
J. Cummings
Who Produces World's Oil.....Aug. 15 92
Private Capital on Road to Getting 'Fair Shake' Abroad.....Aug. 15 85
Gordon H. Barrows
What the Operator Wants From a Drilling Contractor....Sept. 80
A. E. Chester
Contract Drilling Highly Competitive.....Sept. 78
Warren L. Baker
Permian Basin Has 12 Percent of U. S. Rigs.....Oct. 155
Sumatra . . . A Synonym for Serenity.....Sept. 265
Production Is High in the Permian Basin.....Oct. 139
L. J. Logan
Vast Pipe Line Network Serves the Permian Basin.....Oct. 154
Cecil W. Smith
New Mexico Drilling Still Active.....Oct. 156
Keith Anderson
What's the Oil Industry Afraid of?.....Dec. 62

**Investment**
Oil to Be $44 Billion Industry This Year.....Aug. 1 58
L. J. Logan
Management Important in Securing Loans.....Dec. 64
Eugene McElvaney

**Middle East—Also See International News, Features and Statistical Articles**
Will the Growth of Middle East Oil Revive International Compact Talk?.....Feb. 15 80
Ray L. Dudley and Robert E. Spann
State Department, 5 U. S. Firms Discussing Iranian Settlement.....Feb. 15 85
Iran Supplies Some Answers.....June 72
Middle East Prices Up . . . Why?.....Aug. 1 62
Robert E. Spann
New Problems Arise in Iran.....Oct. 94
Robert E. Spann
Watch the Middle East.....Nov. 70
Robert E. Spann

**Offshore**
Offshore Development to Be Speeded Up.....June 53
L. J. Logan
When the Big Winds Blow.....June 48
Al Reese and Robert E. Spann
More Progress Made Toward Offshore Oil Development...July 79

**Taxes**
You Can Save Money on Taxes.....Jan. 64
H. O. Reyburn
Income Tax Encourages Oil Payments.....March 55
E. Earle Tomlins
Higher Taxes on Texas Gas Are Not Advisable.....May 76


# NEWS ANALYSIS


**Agriculture**
The Farmers' Problems Are Oil Industry Problems, Too...Dec. 76

**Atomic Power**
Up and Atom (Industrial Applications of Atomic Power).Dec. 89

**Brazil**
What the New Petrobras Law Means to Brazilian Oil Industry.....Nov. 88

**California**
PAD Told of California Needs.....Jan. 52

**Cartel Charge**
'Cartel' and Tidelands Issues High on Eisenhower Agenda.Feb. 46
Government Drops Criminal Charges in Oil Cartel Suit....May 104

**Coal**
Is the Skidding Coal Industry a Victim of Economic Forces?.....Oct. 121

**Demand**
Seasonally Lower Demand Requires a Cutback in Operations.....March 144
Allowable Reflects Demand Increase.....June 70

**Economics**
Profit Problem.....Feb. 46
Petroleum Industry Looking Forward to Early Return of Competitive System.....April 46

**Federal Power Commission**
Oil Industry Cheers Administration Changes in the FPC..Sept. 101

**Imports**
Miners Join Plea to Curtail Oil Imports.....March 46
IPAA Urges U. S. to Curb Imports.....April 48
It Looks As if the Import Problem Will Be With Us for Another Year.....June 68

**International Petroleum Exposition**
Oklahoma Governor Plugs the IPE.....Jan. 48

**Iran**
Iran Finds Two Buyers for its Oil.....July 90
Iranians Are Finding the Price Was High.....Nov. 86

**Labor**
It's Contract Time Again for OWIU.....April 46
Wages Jumped.....Aug. 1 88

**Laws**
Extension of Trade Act Indicated.....July 90
Need for Stronger Conservation Laws in Western States Cited.....Aug. 1 88

**Leasing**
Attractive Lease Regulations Urged.....Dec. 89

**Natural Gas**
Moves Begun to Limit Natural Gas Output to Market Demand.....Feb. 44
Natural Gas Lid Off.....March 44
Row Over Gas Gathering Tax May Reach Supreme Court.March 46
Next Move Is Up to Gas Companies.....June 68
Bright Future Painted for Natural Gas.....Nov. 88

**Pipe Lines**
Line Would Aid Canada Producers.....Jan. 52
New Pipe Line to Solve Gas Waste Problem in the Spraberry Field.....June 70
Pipe Lines Reflect Growing Demand.....Aug. 1 84
Spraberry to Get Needed Pipe Lines.....Sept. 100
Army on Line (Alaska Pipe Line).....Sept. 104
LPG Pipe Line Expansion Forecast.....Dec. 86

**Prices**
'Shortage Hinges on Price Relief'.....Jan. 52
Price Inquiry?.....Feb. 44
Prices React to Potential Surpluses.....May 104
Prices Mostly Steady After Lid Lifted.....March 48
Raise Puts Crude Postings Above Levels of Price Control Period.....July 88
Oil Executives Put Price Case Before Congressional Committee.....Aug. 1 84
Petroleum Market Stable, Heating Oil Resists Price Increase.....Aug. 1 86
Markets Jumpy After Price Increase.....Sept. 103
U. S. Markets Shaky, Concern Over Crude Prices Indicated.Oct. 120
Why Prices Cut.....Nov. 86

## NEWS ANALYSIS—Continued


**Proration**
Allowables Are Cut Again in Texas....April 48
Spraberry Ruling Hits a Legal Snag in Texas Supreme Court....July 92

**Production Techniques**
Higher Spraberry Recovery Promised (Through "Water Imbibition" Method)....Jan. 50

**Public Relations**
Oil Is at Your Service, America (Oil Progress Week Observance)....Oct. 122
Leach Calls for a Unified Front Within the Oil Industry...Nov. 86

**Refining**
Refining Capacity Is Keeping Pace....Jan. 52
European Refineries Watched Closely....Aug. 1 88

**Rocky Mountains**
Rocky Mountain Finds Customer (Markets Expand)....June 70

**Safety**
Safety Pays Off for Canadian Drillers....July 92

**Statistics**
Producers in U. S. Now Exceed 12,000 (Also Number of Refiners, etc. Given)....Jan. 50

**Steel**
Tubular Goods Still in Strong Demand....March 44

**Storage**
Oil Storage Needs Estimated....Jan. 50

**Taxes**
Plan Would Hike Tax on Tank Trucks....Feb. 46
Depletion Allowance Under Fire Again....Sept. 104

**Tidelands**
'Cartel' and Tidelands Issues High on Eisenhower Agenda..Feb. 46
Tidelands Squabble Near Early Showdown....March 46
Tidelands Issue Still Up in the Air....April 46
Tideland Exploration Is Becalmed....Aug. 1 90
Legal Barriers Are Still Holding Up Offshore Exploration..Sept. 100
California to Resume Offshore Well....Dec. 89

**Transportation**
Transportation Given a Hand for Industry Contributions..Dec. 86

**Uranium**
Oil Industry Will Aid in U. S. Search for Uranium....Jan. 48


## INTERNATIONAL NEWS, FEATURE AND STATISTICAL ARTICLES


**Africa**
Other Africa....Aug. 15 227

**Alaska**
Operation Alaska....Jan. 239
Capt. R. H. Meade, USN
Search for Oil Pushed in the Land of Icebergs....April 290
Alaska....Aug. 15 132

**Albania**
Albania....Aug. 15 176

**Algeria**
Algeria....Aug. 15 218

**Argentina**
Is Argentina Calling for Private Capital?....May 80
Argentina....Aug. 15 142

**Australia**
Australia Is Beating the Bushes for Oil....April 282
J. Lloyd Marshall
Australia....Aug. 15 216

**Austria**
Austrian Oil a Victim of Tensions....Jan. 242
G. G. Rosu
Austria....Aug. 15 172

**Bahrain**
Saudi Arabia and Bahrain....Aug. 15 192

**Bolivia**
Bolivia....Aug. 15 144

**Borneo, British and Indonesia**
Indonesia and British Borneo....Aug. 15 203

**Brazil**
Brazil....Aug. 15 150

**Burma**
Burma....Aug. 15 200

**Canada**
Tests Prove Discovery at Sturgeon Lake....Feb. 1 246
Gilbert M. Wilson
Socony-Vacuum Is Considering Fosterton-Regina Pipe Line....Feb. 1 259
Efficiency Curbs Canadian Drilling Costs....Feb. 15 286
Ralph L. Binning and B. H. Corey
Br-r-r-rother, It's Cold Outside!....April 286
James Joseph
Canadian D3 Play Is Developing Fast....May 286
Gilbert Wilson
Canada Clamps Down on Export of Gas to Meet Needs at Home....May 294
New Canadian Map Shows Trail's End....Oct. 331
Bob Shiels
Canadian Tankers Are Still Busy....Nov. 278
Harry Chapin Plummer
Drilling Operations Continue the Year Round in Canada...May 160
Vern H. Hunter
Canada....Aug. 15 108
Gilbert M. Wilson
1953 a Fruitful Year for Canada....Dec. 253
Gilbert M. Wilson
New Grid System Drafter to Speed Up Exploration....Dec. 262
Dr. Arthur B. Irwin
When the Ice Cometh, Man!....Dec. 268
Will Saskatchewan Discover Its Own Leduc?....Dec. 270
F. H. Edmunds
'Weathered-In' Lease Problem Being Whipped....Dec. 276
M. R. Taylor
Lower Cretaceous in Alberta and Saskatchewan....Dec. 282
A. W. Farmilo

**Central America**
Central America....Aug. 15 122

**Ceram-Netherlands New Guinea**
Ceram-Netherlands New Guinea....Aug. 15 212

**Chile**
Chile....Aug. 15 144

**Colombia**
Colombia....Aug. 15 148

**Cuba**
Cuban Exploration Travels South....June 242
Albert Ruschil de la Roche
Cuba....Aug. 15 136

**Czechoslovakia**
Czechoslovakia....Aug. 15 178

**Denmark**
Denmark....Aug. 15 176

**East Germany**
East Germany....Aug. 15 178

**Ecuador**
Ecuador....Aug. 15 150

**Egypt**
Egypt....Aug. 15 227

**Europe**
Western Europe Opens Arms to Private U. S. Investments....Feb. 1 242

**France**
France....Aug. 15 166

**Germany**
Germany....Aug. 15 168

**Great Britain**
Great Britain....Aug. 15 172

**Hungary**
Hungary....Aug. 15 178

**India**
India....Aug. 15 200

**Indonesia**
Indonesia and British Borneo....Aug. 15 203

**Iran**
Iran Supplies Some Answers....June 72
New Problems Arise in Iran....Oct. 94
Robert E. Spann
Iran....Aug. 15 198
State Department, 5 U. S. Firms Discussing Iranian Settlement....Feb. 15 86

**Iraq**
Iraq....Aug. 15 182

# INTERNATIONAL NEWS, FEATURE AND STATISTICAL ARTICLES—Continued


**Israel**
Israel ..... Aug. 15 228

**Italy**
Genoa Gains Stature as Transit Center ..... Jan. 258
Italy ..... Aug. 15 174

**Japan**
Japan ..... Aug. 15 214

**Kuwait**
Point IV Program . . . The Private Capital Way ..... Sept. 270
Kuwait ..... Aug. 15 187

**Mexico**
Mexico ..... Aug. 15 126

**Middle East**
Middle East Oil Monopoly Said to Be Up to Russia ..... Feb. 1 258
Will the Growth of Middle East Oil Revive International Compact Talk? ..... Feb. 15 80
Ray L. Dudley and Robert E. Spann
Middle East Prices Up . . . Why? ..... Aug. 1 62
Robert E. Spann
Watch the Middle East ..... Nov. 70
Robert E. Spann

**Morocco**
Morocco—A Country on the Threshold of Greater Wealth. Feb. 1 235
Dr. J. Brian Eby

**Netherlands, The**
The Netherlands ..... Aug. 15 170

**Netherlands New Guinea**
Ceram-Netherlands New Guinea ..... Aug. 15 212

**Neutral Zone**
The Big Payoff ..... Aug. 1 229
Neutral Zone ..... Aug. 15 189

**New Zealand**
New Zealand ..... Aug. 15 216

**Pakistan**
Pakistan ..... Aug. 15 200

**Persia (See Iran)**

**Peru**
Peru Perks Up
(Part 1) ..... April 275
(Part 2) ..... May 288
Dr. Juan E. Rassmuss
This Is Talara ..... May 281
Nature Makes it Tough ..... Sept. 272
Dr. J. E. Rassmuss
Peru . . . Modern-Day Trail Blazer ..... Nov. 275
Dr. Cornelius H. Zondag
Peru ..... Aug. 15 153

**Philippines**
Philippines ..... Aug. 15 216

**Poland**
Poland ..... Aug. 15 178

**Qatar**
Qatar ..... Aug. 15 198

**Roumania**
They Paid the Communists' Price . . . Here's Why ..... Aug. 1 234
Roumania ..... Aug. 15 178

**Saudi Arabia**
They're Overcoming Drilling Problems in Saudi Arabia. Aug. 1 146
L. C. Carson
90 Miles an Hour Across the Desert ..... Nov. 284
Saudi Arabia and Bahrain ..... Aug. 15 192

**Sicily**
Sicily ..... Aug. 15 228

**Sumatra**
Sumatra ..... Aug. 15 204

**Sweden**
Swedish Underground Storage Method Proves Successful. March 240

**Taiwan**
Why Is Taiwan Drawing Interest? ..... Dec. 66

**Trinidad**
Trinidad ..... Aug. 15 136

**Tunisia**
Oil in the Olive Orchard? ..... July 247
Tunisia ..... Aug. 15 218

**Turkey**
The Door's Open in Turkey ..... March 233
Cevat E. Tasman
Turkey ..... Aug. 15 198

**U.S.S.R.**
Can Russia Produce 600 Million Barrels of Oil Annually by 1955? ..... March 236
M. N. Jurin
What Are Russia's Tidelands Worth? ..... Nov. 77
Russia and Satellites ..... Aug. 15 176

**Venezuela**
Giant Venezuela Pressure Maintenance Program Planned. April 278
I Saw American Enterprise and Oil Helping Build a Nation ..... March 242
Jenkin Lloyd Jones
Private Capital Oil Companies Help a Nation ..... Aug. 15 157
Venezuela ..... Aug. 15 157

**Yugoslavia**
Yugoslavia ..... Aug. 15 174

**World**
Global Oil and Trouble Grow Together ..... Jan. 237
Dr. Cornelius H. Zondag
World Supply and Demand Increases 4.8 Percent ..... Feb. 15 261
World Crude Reserves Increase 13.5 Billion Barrels .... Feb. 15 264
World Crude Production Continues Steady Climb ..... Feb. 15 266
PAD's Foreign Program Calls for Expanded Activity ... Feb. 15 278
J. E. Brantly
Will the Growth of Middle East Oil Revive International Compact Talk? ..... Feb. 15 80
Ray L. Dudley and Robert E. Spann
World Supply and Demand ..... Aug. 15 59
Robert E. Spann
World Completions and Footage ..... Aug. 15 61
Al Reese
World Crude Production ..... Aug. 15 63
World Crude Reserves ..... Aug. 15 76
Don Kliewer
World Producing Wells ..... Aug. 15 78
World Refining ..... Aug. 15 80
Who Produces World's Oil? ..... Aug. 15 92
Private Capital on Road to Getting 'Fair Shake' Abroad ..... Aug. 15 85
Gordon H. Barrows
State Department, 5 U. S. Firms Discussing Iranian Settlement ..... Feb. 15 85


# PIPE LINE ARTICLES


**Business Machines**
Here's How Machines Measure Gas Volumes ..... March 206-A
W. F. Naeher and Harold G. Morris
How Machines Measure Gas Volumes (Part 2) ..... April 264-E
W. F. Naeher and Harold G. Morris
Network Computations Solved 8 Times as Fast ..... Nov. 238
Price D. Wickersham

**Communications**
El Paso Natural Completes a Circle of Communication .... Jan. 203
B. Maishall Willis

**Compressor Stations**
Pressurized Air Cooling Eliminates Dividing Wall ..... Jan. 202-D
How a Free-Piston Engine Works ..... July 220-A
Comdr. J. J. McMullen and Robert P. Ramsey
How to Suppress Air-Borne Pulsations ..... Aug. 1 210-F
W. N. Linblad
New Developments in Compressor Equipment ..... Oct. 304-A
B. T. Mast
Pre-Running Ignition System ..... Nov. 222-K
Leonard C. Pazderny
Specific Heat Data and the Natural Gas Compressor Plant ..... Nov. 222-L
Robert W. Brooks
Save $20 per HP on Station Costs ..... Nov. 230
Donald M. Taylor

**Construction Activities**
The Trans Mountain Pipe Line . . . 711 Miles and 3000 Contracts ..... Jan. 202-F
New Code for Gas System Piping Is on the Way ..... Jan. 210
Donald M. Taylor
Trans Mountain Plans Extension into U. S. ..... Jan. 222
Fort Worth System Is Planned ..... Jan. 224
Aramco Lays New 12-inch Pipe Line in Persian Gulf ..... Jan. 234-E
U. S. Pipe Lines to Have 13,910 Added Miles ..... Feb. 1 235
Donald M. Taylor
Crude, Products and Gas Lines Planned in 1953 ..... Feb. 15 238
Alice L. Given
Service Pipe Line Completes 'Big Inch' Expansion Program ..... March 210
North America's Largest Crude Oil Line Is Now in Operation ..... May 256
The U. S.'s Most Powerful Crude Oil Line Pump Station ..... May 258
Sinclair's Big-Inch Line on Stream ..... June 214-H
Anthony Gibbon
Permian Basin to Get Important Gas Outlet ..... Oct. 305
Bids on Alaskan Line Open ..... Oct. 316

# PIPE LINE ARTICLES—Continued


**Construction Methods—also see Underwater Construction**

Efficiency Keynotes Takeup Job....Feb. 1 232-D
Philip L. McLaughlin
Well Points Whip Quicksand....March 206-D
J. M. Steele
The Rock Spread....April 248-A
Don Taylor
This Makes Pipe Cleaning Easier....May 254-A
Carl I. Huss
Sinclair's Big-Inch Line on Stream....June 214-H
Anthony Gibbon
How to Choose a Pig....June 232-I
T. D. Williamson, Jr.
How the World's Deepest Submarine Line Was Laid....Sept. 246-H
Donald M. Taylor
How they Crossed the Straights of Mackinac....Oct. 304-H
Don Taylor
Permian Basin to Get Important Gas Outlet....Oct. 305
Maintenance Truck Saves Money on Spread....Nov. 222-X
Southern Natural Passes the Billion Mark....Nov. 223
Darndest Pipe Line Ever Constructed....Dec. 226
Donald M. Taylor
How They Pulled Seven Lines at Once Across a 2500-Foot Wide Channel....Dec. 224-F
Donald M. Taylor

**Contracts**

The Trans Mountain Pipe Line . . . 711 Miles and 3000 Contracts....Jan. 202-F

**Controls—See Instrumentation**

**Corrosion**

Pipe Line Corrosion and Cathodic Protection
Marshall E. Parker
Part 1—Soil Resistivity Surveys....Feb. 210
Part 2—Potential Surveys....March 222-J
Part 3—Line Currents....April 248-F
Part 4—Current Requirement Surveys....May 270-H
Part 5—Rectifier System for Coated Lines....June 232-F
Part 6—Ground Bed Design and Installation....July 220-O
Part 7—Magnesium Anodes on Coated Lines....Aug. 1 210-J
Part 8—Hot Spot Protection with Magnesium Anodes. Sept. 246-S
Part 9—Stray Current Electrolysis....Oct. 304-T
Part 10—Interference in Cathodic Protection Systems..Nov. 222-T
Part 11—Operation and Maintenance of Cathodic Protection Systems....Dec. 224-S
How Dehydrators Fight Internal Pipe Corrosion....April 248-H
R. P. Dougherty
Here's a New Development in Corrosion Protection....June 232-B
Roy C. Jorgensen and Burke Douglas
Using Ultrasound to Find Internal Pipe Corrosion....Aug. 1 210-R
Donald C. Erdman and S. K. Gally

**Dehydration**

How Dehydrators Fight Internal Pipe Corrosion....April 248-H
R. P. Dougherty
Mobile Units Now Being Used for Dehydration Plant Repairs....May 255

**Design—also see Compressor Stations, Pump Stations, etc.**

New Code for Gas System Piping Is on the Way....Jan. 210
Donald M. Taylor
Progress in Products Pipe Lines....Feb. 1 201
S. S. Smith
How Flanges Work and Why They Leak....March 222-A
Robert G. Blick
Applying Graphical Methods to Square Footing Designs...May 254-D
Charles H. Fork
This New Type Control Instrument....June 214-A
S. S. Smith
Design of Rectangular Footings....June 214-F
Charles H. Fork
What Is "NPSH"?....Aug. 1 210-R
Dan R. Rankin
It's Easy to Determine NPSH....Sept. 246-L
Dan R. Rankin
New Developments in Compressor Equipment....Oct. 304-A
B. T. Mast
Evangeline System Has Outstanding Features....Nov. 222-G
Specific Heat Data and the Natural Gas Compressor Plant. Nov. 222-L
Robert W. Brooks
Network Computations Solved 8 Times as Fast....Nov. 238
Price D. Wickersham
Buckeye System Designed for Easy Expansion....Nov. 246
Donald R. Merriman
Electric Wires in Pipe Coating Prevent Line Freeze-Up...Dec. 224-V
Interprovincial Solves Cold Weather Problems....Dec. 224-K
H. LeM. Stevens Guille
Gas Jet Compressors....Dec. 224-A
George F. Fletcher

**Electrical Maintenance**

Pressurized Air Cooling Eliminates Dividing Wall....Jan. 202-D
Surge Protection of Motors....Feb. 1 200-A
B. M. Kleinman
How to Maintain Electrical Equipment....July 221
H. R. Meyer
Here's How to Check Motor Trouble....Aug. 1 210-A
L. J. Cormack

**Engines**

How a Free-Piston Engine Works....July 220-A
Comdr. J. J. McMullen and Robert P. Ramsey
Absorption Unit Cools Air Intake....Oct. 304-N
Robt. C. Coblentz
Pre-Running Ignition System....Nov. 222-K
Leonard C. Pazderny

**Evaporation**

Reduce Evaporation Losses 80 to 90 Percent....Aug. 1 211

**Fire Control**

They Fight Their Neighbors' Fires....Oct. 304-E
Al Reese
How to Control Storage Tank Fires....Feb. 1 232-A
J. H. Burgoyne

**Flow**

Specific Heat Data and the Natural Gas Compressor Plant. Nov. 222-L
Robert W. Brooks

**Gas Analysis**

You Can Analyze Gas in the Field....Sept. 247
Myron L. Robinson

**Gas Fired Turbines**

How Are Gas Turbines Doing?....Nov. 222-A
W. V. Holik
How Are Gas Turbines Doing?....Nov. 222-C
J. W. Blake
How Are Gas Turbines Doing?....Nov. 222-D
E. G. Stepp
How Are Gas Turbines Doing?....Nov. 222-E
G. Carl Cooper

**General**

The Organization Chart vs. Loyalty and High Morale....Jan. 234-B
H. H. Anderson
How Flanges Work and Why They Leak....March 222-A
Robert G. Blick
Make Weather Work for You....July 220-T
Edgar R. Hichens

**Instrumentation**

Progress in Products Pipe Lines....Feb. 1 201
S. S. Smith
Automatic Pump Station Eliminates Looping Need....March 222-H
Bob Shiels
Automatic Shutdown Device Developed for Main Line Block Valves....May 254-J
Gene Proper
Radioactive Controls Pay Off....May 270-D
D. E. Hull and B. E. Fries
This New Type Control Instrument....June 214-A
S. S. Smith
This New Flowmeter Measures True Mass-Rate....June 215
Y. T. Li and P. A. Lapp
Using Ultrasound to Find Internal Pipe Corrosion....Aug. 1 210-R
Donald C. Erdman and S. K. Gally
Locating Holidays Underground Is Easier....Aug. 1 210-U
New Electronic Control System....Sept. 246-V
Curtis H. Scruggs
You Can Analyze Gas in the Field....Sept. 247
Myron L. Robinson
Evangeline System Has Outstanding Features....Nov. 222-G
How Electric Valve Operators Work....Nov. 222-B
E. Conway Thompson
Save $20 per HP on Station Costs....Nov. 230
Donald M. Taylor
TGT Delivers Gas by Remote Control....Dec. 224-N
E. S. Plank and T. K. Davis

**Loading**

Barge Loading Made Easier....Sept. 246-X

**Maintenance—see Pipe Line Maintenance, Pump Stations, Compressor Stations**

**Maps**

Shell Pipe Lines Crisscross Seven States....Jan. 210
Humble's Pipe Line Network Serves Texas and New Mexico....Feb. 1 214
Service Pipe Line Completes 'Big Inch' Expansion....March 210
Texas Gas Is Still Growing....April 253
United Gas System Serves "The Gulf South"....May 264
Buckeye Pipe Line Company—67 Years Old and Still Growing....June 220
Northern Natural Gas Company....July 224
Columbia in 7th Year of Expansion Program....Aug. 1 215
TET Turns 'Big Inch' Into a Big Operation....Sept. 251
Southern Natural Passes the Billion Mark....Nov. 223
From 40 Miles in 1886 . . . To 1183 Miles Today....Dec. 230
Donald M. Taylor

**Measurement**

Progress in Products Pipe Lines....Feb. 1 201
S. S. Smith
This New Flowmeter Measures True Mass-Rate....June 215
Y. T. Li and P. A. Lapp
You Can Analyze Gas in the Field....Sept. 247
Myron L. Robinson

**Office Procedure**

Here's How Machines Measure Gas Volumes
(Part 1)....March 206-A
(Part 2)....April 264-E
W. F. Naeher and Harold G. Morris
How a Pictorial Index Can Save You Time....Dec. 225
B. G. Sauthoff

**Personnel Handling**

The Organization Chart vs. Loyalty and High Morale....Jan. 234-B
H. H. Anderson
Time Out for Training....July 220-K

# PIPE LINE ARTICLES—Continued


**Pipe Line Construction—see Construction Activities and Construction Methods**

**Pipe Line Maintenance and Operation**

Pressure Testing Lines with Oil....Feb. 1 200-F
Carl I. Huss
This Makes Pipe Cleaning Easier....May 254-A
Carl I. Huss
How to Choose a Pig....June 232-I
T. D. Williamson, Jr.
Make Weather Work for You....July 220-T
Edgar R. Hichens
Locating Holidays Underground Is Easier....Aug. 1 210-U
Transco Uses Jets to Lower Hudson Crossing 15-20 Feet..Sept. 246-A
I. W. Dods
How to Plan a Brush Control Program....Sept. 246-P
John H. Burke

**Pipe Line Personalities**

Pipe Line Portrait—H. H. Anderson....Jan. 218
Al Reese
Pipe Line Portrait—W. C. Kinsolving....Feb. 1 224
Pipe Line Portrait—Roy J. Tibbets....March 206-L
Pipe Line Portrait—Ralph B. McLaughlin....April 264-A
Al Reese
Pipe Line Portrait—Harold C. Price....June 214-K
Pipe Line Portrait—S. S. Smith....Sept. 246-F

**Public Relations**

The Organization Chart vs. Loyalty and High Morale....Jan. 234-B
H. H. Anderson
The Landowner—Enemy or Friend?....March 206-J
Charles A. Lingo

**Pulsations**

How to Suppress Air-Borne Pulsations....Aug. 1 210-F
W. N. Linblad

**Pump Stations**

Progress in Products Pipe Lines....Feb. 1 201
S. S. Smith
How Flanges Work and Why They Leak....March 222-A
Robert G. Blick
Automatic Pump Station Eliminates Looping Need....March 222-H
Bob Shiels
How Mechanical Agitators Rid Tanks of Sediment....July 220-H
J. H. Halpine
The U. S.'s Most Powerful Crude Oil Line Pump Station..May 258
How to Maintain Electrical Equipment....July 221
H. R. Meyer
Here's How to Check Motor Trouble....Aug. 1 210-A
L. J. Cormack
What Is "NPSH"?....Aug. 1 210-N
Dan R. Rankin
It's Easy to Determine NPSH....Sept. 246-L
Dan R. Rankin
Evangeline System Has Outstanding Features....Nov. 222-G

**Radio and Electronics**

El Paso Natural Completes a Circle of Communication....Jan. 203
B. Marshall Willis
New Electronic Control System....Sept. 246-V
Curtis H. Scruggs

**Reclaiming Pipe and Fittings**

Efficiency Keynotes Takeup Job....Feb. 1 232-D
Philip L. McLaughlin

**Right-of-Way**

The Landowner—Enemy or Friend?....March 206-J
Charles A. Lingo
How to Plan a Brush Control Program....Sept. 246-P
John H. Burke

**River Crossings—see Underwater Construction**

**Rules of Thumb**

**Corrosion Protection**

1. What Spacing for Test Leads to Measure Current on a Pipe Line?....Dec. 261
2. How Can the Life of Magnesium Anodes Be Predicted?....Jan. 234-A
3. How Can Output of Magnesium Anodes Be Predicted?....Feb. 1 216
4. What Will Be the Resistance to Earth of a Group of Graphite Anodes, in Terms of the Resistance of a Single Anode?....April 249
5. How to Estimate the Monthly Power Bill for a Cathodic Protection Rectifier....April 249
6. What Will Be the Resistance to Earth of a Single Graphite Anode?....May 271
7. How Can the Current Output of Magnesium Rod Used for the Cathodic Protection of Heat Exchanger Shells Be Predicted?....June 225

**Engineering Design**

1. How to Find Pipe Weight from Outside Diameter and Wall Thickness....Dec. 261
2. How Do You Estimate Compressor Station Fuel Needs?....Feb. 1 216
3. What Is the Hydrostatic Pressure Due to a Column of Oil H Feet in Height?....March 207
4. Find the Stress in Wall of Pipe Due to Internal Pressure....March 207
5. How Much Pipe Length Is Lost in Making up Screwed Joints?....June 225
6. How to Determine the Buoyancy of Bare Steel Pipe....June 225
7. How to Determine the Crop Acreage Included in a Right-of-Way Strip....July 220-G
8. How to Find the Cacapity of Reciprocating Pump....Aug. 1 210-E
9. A Practical Way to Calculate Gas Flow for Pipe Lines....Nov. 244
10. A Quick Way to Determine Size of Gas Gathering Lines....Dec. 224-J
11. How to Size Electric Motors for Crude Gathering System Pumps....Dec. 224-J

**Pipe Line Construction**

1. How Much Coal-Tar Enamel for a Mile of Pipe Line?....Dec. 261
2. How Much Primer for a Mile of Pipe?....Jan. 234-A
3. How Much Wrapping for a Mile of Pipe Line?....Jan. 234-A
4. How to Identify the Schedule Number of Pipe by Direct Measurement....May 271
5. How Many Cubic Yards of Excavation in a Mile of Ditch?....July 220-G
6. How Much Welding Rod Is Required for a Mile of Schedule 40 Pipe Line?....Aug. 1 210-E
7. What Is the Cost of Asbestos Felt for a Mile of Pipe?....Sept. 253
8. How Deep Should Telephone and Powerline Poles Be Set in Ground?....Oct. 304-S

**Miscellaneous**

1. What Is the Linefill of a Given Pipe in Barrels per Mile?....Jan. 234-A
2. How Fast Does Oil Move in a Pipe Line?....Feb. 1 216
3. How to Gauge a Horizontal Cylindrical Tank....March 207
4. How Much Gas Is Contained in a Given Line Section?....April 249
5. Volume of Liquid in Vertical Cylindrical Tanks....May 271
6. How Can the Approximate Throughput Capacity of a Pipe Line Be Estimated from the Pipe Size Alone?....July 220-G
7. How to Determine the Size Wrench Needed for Pipe Flange Stud Bolts....Aug. 1 210-E
8. How to Find the Resistance and Weight of Copper Wires....Sept. 253
9. How to Identify the Series Number of Flanged Fittings....Oct. 304-S
10. How to Determine the Length of a V-Belt....Oct. 304-S

**Safety**

You're Safer . . . On the Job!....Jan. 202-A
Cecil L. Hightower
New Code for Gas System Piping Is on the Way....Jan. 210
Donald M. Taylor
Pressure Testing Lines with Oil....Feb. 1 200-F
Carl I. Huss
How to Control Storage Tank Fires....Feb. 1 232-A
J. H. Burgoyne
Automatic Shutdown Device Developed for Main Line Block Valves....May 254-J
Gene Proper
Pipeliner Frogmen . . . Safe from Sharks....July 220-R
They Fight Their Neighbors' Fires....Oct. 304-E
Al Reese

**Station Construction—see Compressor Stations and Pump Station**

**Storage**

How to Control Storage Tank Fires....Feb. 1 232-A
J. H. Burgoyne
How to Find a Field for Underground Natural Gas Storage....April 264-B
Henry P. Wheeler, Jr. and William E. Eckard
How Mechanical Agitators Rid Tanks of Sediment....July 220-H
J. H. Halpine
Reduce Evaporation Losses 50 to 90 Percent....Aug. 1 211

**Underwater Construction**

Aramco Lays New 12-inch Pipe Line in Persion Gulf....Jan. 234-E
The Rock Spread....April 248-A
Don Taylor
Pipeliner Frogmen . . . Safe from Sharks....July 220-R
Transco Uses Jets to Lower Hudson Crossing 15-20 Feet..Sept. 246-A
I. W. Dods
How the World's Deepest Submarine Line Was Laid....Sept. 246-H
Donald M. Taylor
How They Crossed the Straits of Mackinac....Oct. 304-H
Don Taylor
Southern Natural Passes the Billion Mark....Nov. 223
How They Pulled Seven Lines at Once Across a 2500-Foot Wide Channel....Dec. 224-F
Donald M. Taylor

# PIPE LINE HINTS


Engine Trouble Can Be Reduced....Jan. 230
Chemical Treater Is Made of Scrap....Jan. 230
Field Forces Can Build Simple Light Standard....Jan. 231
Long-Handled Mirror Aids Weld Inspection....Jan. 231
Painter Can Keep This Air Tank Handy to Job....Jan. 232
Pipe Heater Has Multitude of Uses....Jan. 233
Repair Shop on Wheels Eases Yard Maintenance....Jan. 234
Ramp Helps in Racking Pipe in Storage Yard....Feb. 1 227
Chute Speeds Grading of Pipe....Feb. 1 227
Casters Provide Portable Bench....Feb. 1 228
How to Reduce Products Loss....Feb. 1 228
Seal Protects Field Joints....Feb. 1 230
Rails Mounted in Pipe Sleeves....Feb. 1 232
Revolving Gate Made of Scrap....Feb. 1 232
Furnace Relieves Welding Stresses....Feb. 15 252
Auxiliary Air Supply for Controls....Feb. 15 252
Storage Reel Made of Pipe....Feb. 15 252
Jet Pump Disposes of Undrained Water....Feb. 15 254
Rock Shield Protects Pipe Coating....Feb. 15 256
Scraper Tanks Are Easy to Clean....Feb. 15 256
Simple Installation Provides Lab Samples....Feb. 15 257
Potentials Read by Fixed Installations....Feb. 15 257
Split Sleeves Cached on Route for Emergencies....March 226
Device Reports Light Failure....March 226
Solenoid Valve Switches Fuel....March 227
Warehouse Stove Moves on Casters....March 228
Self Aligning Handle is Made with U-Joint....March 229
Small Lines Trough Eliminates Hazard....March 229
Pipe Clamps Minimize Construction Stress....March 230
'Horses' Feed Pipes into Saws....March 230
Barrel Sling Makes Filling Easy....April 268
Lever Device Lifts Pipe Simply....April 268
Sign Board Made of Casing Vent....April 268
Metal Cover Protects Electrical Equipment....April 270
Doorstops Lessen Hazards of Ladder....April 270
Cradle Device Aids Pipe Handling....April 272
Racking Drums Aids Handling....May 274
Textile Gauze Aids Engine Break-in....May 274
Rollers Relieve Stress on Bents....May 274
Grinder on Wheels is Easy to Move....May 276
Dispenser Keeps Oil Free of Dust....May 276
Adjustable Tripod Holds Pipe Steady....May 276
Hydrant Effective in Warm Climates....May 278
Guy Wire Shields a Safety Measure....May 278
Making a Multiple Pipe Line Crossing Over River....July 232
Making Pipe Stool....July 234
Building Walkway....July 234
Holding Tools on Truck....July 237
Racking Wrenches....Aug. 1 222
Storing Equipment....Aug. 1 222
Forcing Pig in Place With Jack....Aug. 1 222
Finishing Ditch....Aug. 1 224
Carrying Tools on Cart....Aug. 1 224
Wrapping and Laying Pipe in Ditch....Aug. 1 226
Making Utility Welder's Truck Handy....Sept. 260
Racking Oxygen Bottles....Sept. 260
Aiding Fabrication of Pipe....Sept. 261
Saving Truck Tractors from Wear....Sept. 261
Cooling Boat Engine....Sept. 261
Identifying Trucks....Sept. 261
Handling Drums....Sept. 262
Storing Rods and Bars....Sept. 262
Mounting Hot-Pass Trailer on Tracks....Oct. 318
Draining Liquid from Surge Chamber....Oct. 318
Closing Gate Valves....Oct. 318
Diverting Troublesome Stream....Oct. 320
Lifting Strainer....Oct. 320
Jetting Piling for Small Crossings....Nov. 264
Publicizing Slogans....Nov. 264
Keeping Station Clean....Nov. 264
Racking Equipment....Nov. 267
Keeping Engine Performance Data....Nov. 268
Handling Drums....Nov. 268
Locating Extinguishers....Nov. 270
Holding Shovels....Nov. 270
Speeding X-Ray on Crossing....Nov. 272
Keeping Welding Rods....Nov. 272
Making a Guard for a Pump Shaft....Dec. 246
Rolling River Clamps....Dec. 246
Carting Equipment....Dec. 246
Forming Packing Rings....Dec. 248
Protecting Water Leg on Separator....Dec. 248
Making a Hose Reel....Dec. 248
Racking Small Pipe....Dec. 250
Checking on Gauges....Dec. 250


# PRODUCTION ARTICLES


**Acidizing**
Compressed Gas Cuts Carthage Acidizing Costs....Aug. 1 180
P. S. Clinkenbeard
Well Stimulation at North Cowden Pays....Oct. 264
J. E. Kastrop

**Artificial Lift—Also see "Gas Lift" and "Pumping"**
Artificial Lift Equipment for 21,342 Wells Is Forecast..Feb. 15 181
J. E. Kastrop

**Bailing**
Shop-Made Pump Aids Operators....Jan. 179

**Casing**
How to Identify Casing In Mixed Strings....April 144

**Completion Practices**
Dual Completion Takes Two Full Size Tubing Strings....Feb 1 162
Royal W. Reiss and J. E. Kastrop
Dual Completions Pay off in Illinois....March 163
Frank H. Hunter
Magnolia Makes an Unusual Completion in Wilcox....June 176
J. E. Kastrop
Triple Completion Takes Three Tubing Strings....Nov. 169
Royal W. Reiss

**Corrosion**
Don't Let Corrosion Eat Up Your Profits....Feb. 1 172
Dan H. Carpenter
Brine Corrosion of Steel Vessels....May 206
Cecil W. Smith
Little Bugs—Big Problems....Jnue 170
Dr. O. B. Williams
Oil Field Scale and Corrosion....June 191
E. N. Frisius
Field Tours Highlight West Texas NACE Meet....Sept. 201

**Decline Curves**
How to Select the Best Decline Curve....Dec. 180
D. E. Menzie

**Engines**
Vapor Phase Cooling Boosts Engine Efficiency....July 182
W. L. Giezentanner

**Fracturing**
New Multiple Fracturing Process....Jan. 159
George Howard and William G. Bearden
Fracturing Sandstones of the Illinois Basin....Aug. 1 192
F. D. Furber and J. C. Wilson

**Gas Injection**
Hydraulic System Drives Cooling Fans....Sept. 219
Conditioning Engine Exhaust Gases for Repressuring....Sept. 224
Dr. J. N. Breston

**Gas Lift**
New Correlation Simplifies Pressure Gradient
Calculation in Tubing....June 161
Fred H. Poettmann and Paul G. Carpenter
Why Worry About Port Size in Gas Lift Valves?....Nov. 187
B. J. (Dusty) Rhoads, Jr.

**Logging**
Simultaneous Log of Radioactivity Curves Cuts
Standby Time in Half....Jan. 123
Gilbert Swift and C. C. Roberts
Hole Diameter Influences Neutron Derived Porosity....Jan. 172
C. B. Scotty and E. F. Egan
Electrical Conduction in Fluid-Saturated Rocks....Feb. 1 113
Dr. B. F. Howell, Jr.
Electrical Conduction in Fluid-Saturated Rocks....March 142
Dr. B. F. Howell, Jr.
Guess Work is Removed in Flood Evaluations....May 216
N. J. Mellies and C. W. Clark

**Materials Control**
Materials Control Can Save You Money....Dec. 198
J. Tilman Ussery

**Measurement and Testing**
How to Solve Problems in Gas Measurements....Nov. 194
Dudley C. Penick
Electronics Speeds Gas Volume Calculations....March 156
A. C. Buchanan, Jr. and Hubert Skinner

**Perforating**
Four-Way Perforating Aids Squeeze Cementing....April 222
J. E. Kastrop

**Piping**
Portable Pipe Vise Speeds Threading and Cutting....Jan. 190

**Producing Depths**
Producing Depth Records Fall in Ten Areas....Feb. 15 204

**Producing Rates**
U. S. Crude Oil Production May Reach
2310 Million Barrels....Feb. 15 182
Natural Gasoline Output to Top 1952 High....Feb. 15 192
Natural Gas Production, Value Increase....Feb. 15 194
LPG Production, Sales to Rise....Feb. 15 212

**Producing Wells**
Producing Oil Wells Remain at Record Level....Feb. 15 208

**Pumping**
How to Pump Deep Dual Completions Alternately....Jan. 188
J. R. Hatfield
How to Select a Subsurface Pump Plunger to Fit the Job.May 224
Kenneth N. Mills
Interpretation of Dynamometer Cards....July 175
J. H. Russell, Jr.
Foundation Anchor Device Fits Many Sizes
of Pumping Units....July 204
Proper Gas Control in Pumping Wells....Dec. 188
Kenneth N. Mills

**Pumping Wells—See "Artificial Lift"**

**Research**
'In Situ' Combustion....Nov. 184

# PRODUCTION ARTICLES—Continued


**Reservoir Engineering**

New Method Estimates Gas Well Performance....Jan. 180
Dr. David Cornell

Permeability Determined from Production Data....Feb. 1 186
Dr. David Cornell

It Pays to Know Your Petroleum
(Part 1) ....March 165
(Part 2) ....April 208
Norman J. Clark

Stop That Thief!....May 234
F. R. Cozzens

**Safety**

How You Can Combat Hydrogen Sulfide Hazards....Nov. 190
George Austin

Field Testing Can Prevent Flange Leaks....May 201
Marvin R. Jones and Frank N. Baldwin, Jr.

**Salt Water Disposal**

18,000 Barrels of Brine Disposed Daily in Six Wells at Loudon ....Jan. 164
J. F. Armstrong

**Secondary Recovery—See Water Flooding and Gas Injection**

**Separation, Oil, Gas, Water**

How Condensate Recovery Increased....Aug. 1 176
Harold O. Ebeling

**Tank Batteries**

New Automatic Tank Battery....April 195
W. A. Middleton and E. B. Laguki

**Testing, Formation**

How to Design a Radical Flow Settling Basin....March 182
H. H. Elliston

Subsurface Pressures Tell Story....Feb. 1 155
C. C. Olson

**Treating**

New Wash Tank Design....Sept. 203
Arthur R. Williams

New Wash Tank Design....Oct. 278
Arthur R. Williams

Take A Look at Treating Oil Emulsions....Nov. 178
Walter E. Huffman

**Unitization**

Unitization . . . And How it Works....July 198
C. H. Keplinger and J. M. Wanenmacher

**Water Flooding**

Inverted-Type Packer Solves Salt Water Injection Problem.Jan. 186
George S. Flanders

Nowata Water Floods Use Modern Techniques....Feb. 1 178
Anthony Gibbon

Boron Compounds Used as Water-Flood Tracers....April 214
P. G. Carpenter, T. D. Morgan and E. D. Parsons

Water-Flooding Like Wildcatting (Editorial)....May 75
Warren L. Baker

Healdton Has Big Waterflood Potential....July 190
C. H. Riggs and John E. Way

How to Test Quality of Injection Water....Aug. 1 189
William F. Cerini

How to Estimate Water Requirements....Sept. 214
R. C. Earlougher and W. A. Neath

Water-Flood Restores Youth to Old West Texas Lease....Oct. 251
J. E. Kastrop

Unique Filter System . . . Featured in Pilot Flood....Oct. 272
R. O. (Jack) Major

Gravity Injection Pays Dividends at Redwater....Dec. 173
E. Hochhausen and I. M. Rice

**Wire Line**

Wire Line Methods Cut Workover Costs....Aug. 1 165
J. E. Kastrop

**Workovers**

Workovers Revive California Field....March 174
R. B. Teissler

Mud-Stuck Tubing Recovered by String-Shot Backoff Method ....April 200
Floyd Scott, Jr.

Use of Existing Tubing Cuts Workover Costs....June 186
E. O. Stewart and Henry Priesmeyer


# PRODUCTION HINTS


Truck Bumper Has Many Uses....Jan. 193
Scrubber Float Stops Engine....Jan. 193
Swing Line Simplifies Tank Hookup....Jan. 193
Pulley Hold-Down Reinforced....Jan. 194
Salvaged Tank is Lease Gun Barrel....Jan. 194
Air Scoop Cools Truck Drivers....Jan. 195
Disposal Pump is Auto Controlled....Jan. 196
Rig Unit Frame Invaluable Aid....Jan. 197
Disposal Line is Protected by Casing....Jan. 197
Extension Wrench Operates Plug Valve....Jan. 198
Intermitters on Line Control Flow....Jan. 200
Umbrella Arm is Easy to Adjust....Feb. 1 188
Gas Substituted for Paint Gun Air....Feb. 1 188
Inhibitor Stops Annulus Damage....Feb. 1 188
Enclosure Forms Air Duct to Cool Engine....Feb. 1 190
Regulators Control Disposal of Brine....Feb. 1 192
Elevated Rack Makes Lube Handling Easy....Feb. 1 192
Temporary Fuel Station is Portable....Feb. 1 193
Well Enclosure is Easy to Move....Feb. 1 194
Well Operations are Recorded on Work Card....Feb. 1 195
Lines are Hooked Up for Reverse Flow....Feb. 1 195
Portable Rig Floor Has Height Adjuster....Feb. 1 196
Shop-Made Grader Does the Job....Feb. 1 198
Enclosure Aids in Oil Heating....Feb. 15 226
Compressor Housing is Removable....Feb. 15 226
Walkway is Safety Feature of Pit....Feb. 15 226
Steam Whistle is Lease Signal....Feb. 15 228
Air Tongs Loosen Control Head Ram....Feb. 15 228
Elevated Rack Aids Tank Reclamation....Feb. 15 230
Lift Bail on Pump is Quick Weight Hoist....Feb. 15 232
Spare Gas Tank Mounted on Truck....March 194
Hand Brake Placed Near Well Head....March 194
Grease Fitting Protects Lock....March 194
Overflow Piping Protects Engine....March 196
Well Sucker Rods Form Cellar Cover....March 198
Drain Line and Can Collect Oil Leakage....March 198
This Flywheel Guard is Easily Detached....March 199
Check Valve Aids in Collecting Oil....March 200
Coating is Protection for Christmas Tree....March 201
Slight Gas Pressure Aids Water Pump....March 202
Hinged Roof Protects Drawworks....March 203
Parallel Flow Lines Hookup Proves Flexible....March 204
Volume Tank Adapted to Sand Trap....April 232
Tank Ups Gas Lift Efficiency....April 232
Float Prevents Gas Flow Into Oil Line....April 236
Vertical Chamber Scrubs Control Gas....April 238
Device Makes Height of Pipe Adjustable....April 239
Rope Hanger is Made from Two Auto Wheels....April 240
Line Gas Powers Chemical Injector....April 240
Half Drum Collects Leakage from Heater....April 243
Heater Stack has Adjustable Dampner....April 244
Separator Made from Salvage Pipe....April 246
Portable Racks Support Sucker Rods....May 243
Valve Operated by Rod Handle....May 243
Heater Pilot Has Fuel Scrubber....May 243
Wheel Step Aids in Engine Repair....May 244
Hose Drains Water From Heater-Treater....May 246
Riser Simplifies Engine Oil Check....May 248
Radiator Chamber is Easily Filled....May 249
Pumping Unit Made Portable by Rails....May 250
Shop-Made Rig Rethreads Bolts....May 252
Folding Rack Provides Maximum Side Clearance....June 197
Traps Placed in Gathering Lines Aid Cleaning....June 197
Salt Water Line is Vented to Air....June 199
Motor is Protected by Shelter on Rails....June 200
Steel Pipe Ladder Aids in Servicing....June 202
Combination Fence Guards Pumping Well....June 204
Step-Platform Aids on Radiator Check....June 208
Anchor System Aids Pump Installation....June 210
Making Vertical Flow Line Manifold....July 206
Skidding Mud Tank with Sand Line Unit....July 206
Draining Filter Tank....July 206
Removing Welding Fumes by Exhauster....July 208
Racking Sucker Rod Stands....July 214
Rigging Extension Exhaust....July 218
Installing Flexible Flow Line Manifold....Aug. 1 201
Lubricating Polish Rod Stuffing Box....Aug. 1 202
Anchoring Gas Line....Aug. 1 204
Stopping Metal Door....Aug. 1 206
Protecting Separator ....Aug. 1 206
Hauling Tools in Rack on Truck Fender....Aug. 1 208
Elevating Hydraulic Power Oil Unit....Sept. 234
Keeping Cattle Away....Sept. 234
Preventing Choke From Freezing....Sept. 237
Treating with Thermosyphon Heater....Sept. 237
Back-Flowing Gas Well....Sept. 238
Cleaning Lease Fuel Gas....Sept. 240
Protecting Christmas Trees....Sept. 242
Cleaning Hand Tools....Sept. 242
Controlling Cooling Tower Air Inlet....Sept. 243
Adding Blow-Off Line....Sept. 244
Mounting Hydraulic Pumping Unit....Oct. 287
Skid Mounting Water Tanks....Oct. 288
Cutting Pipe and Cable-Laying Costs....Oct. 290
Starting Heavy-Duty Engines....Oct. 302
Controlling Production at Battery....Nov. 206
Moving Pumping Unit Base....Nov. 206
Guarding Well Head....Nov. 206
Collecting Crude Samples....Nov. 210
Aiding Pump Efficiency....Nov. 212
Heating Gas ....Nov. 214
Guarding Pumps ....Nov. 216
Lubricating Polish Rod....Nov. 218
Handling Heavy Gear....Nov. 220
Driving Water Well Pump....Nov. 220
Reducing $H_2S$ Gas Hazard in Tanks....Dec. 206
Protecting Motor ....Dec. 206
Dispersing Chlorine Gas....Dec. 209
Topping Tanks ....Dec. 209
Lubricating Inhibitor ....Dec. 210
Sampling Crude ....Dec. 212
Supporting Meter ....Dec. 214
Separating Gas ....Dec. 216
Servicing Heat ....Dec. 219
Supplementing Gas ....Dec. 219

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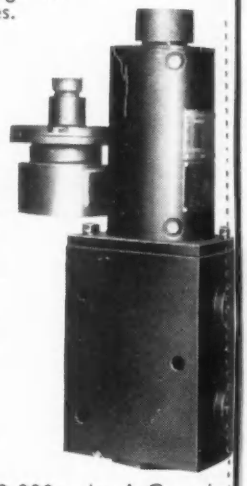

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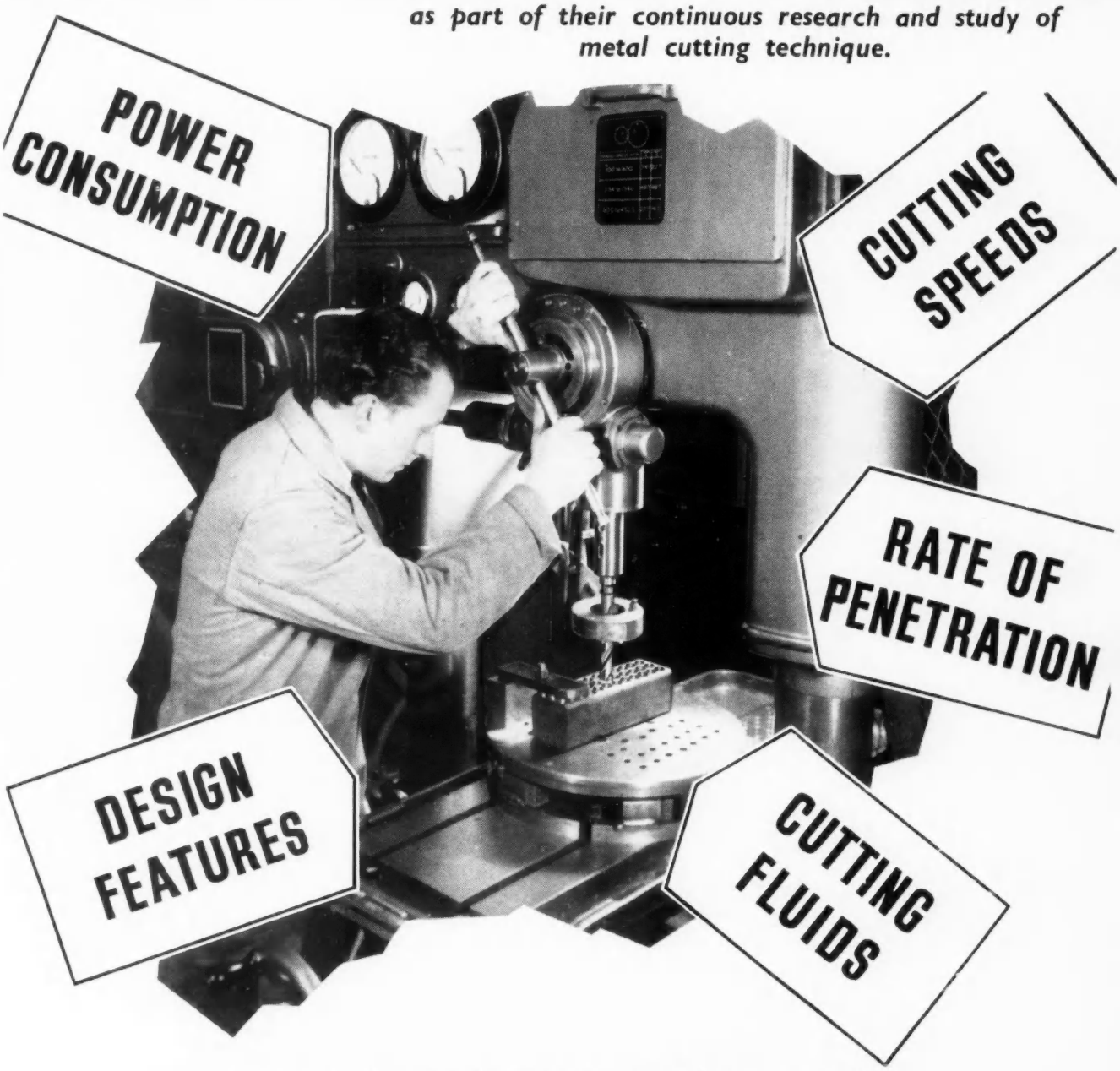


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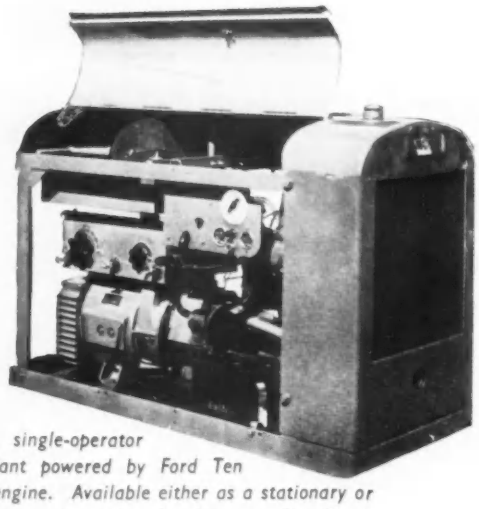

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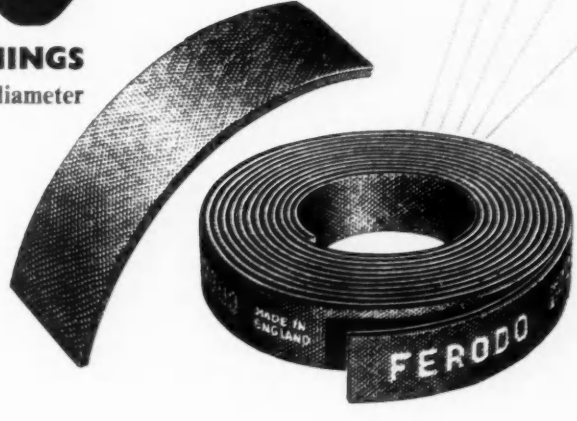


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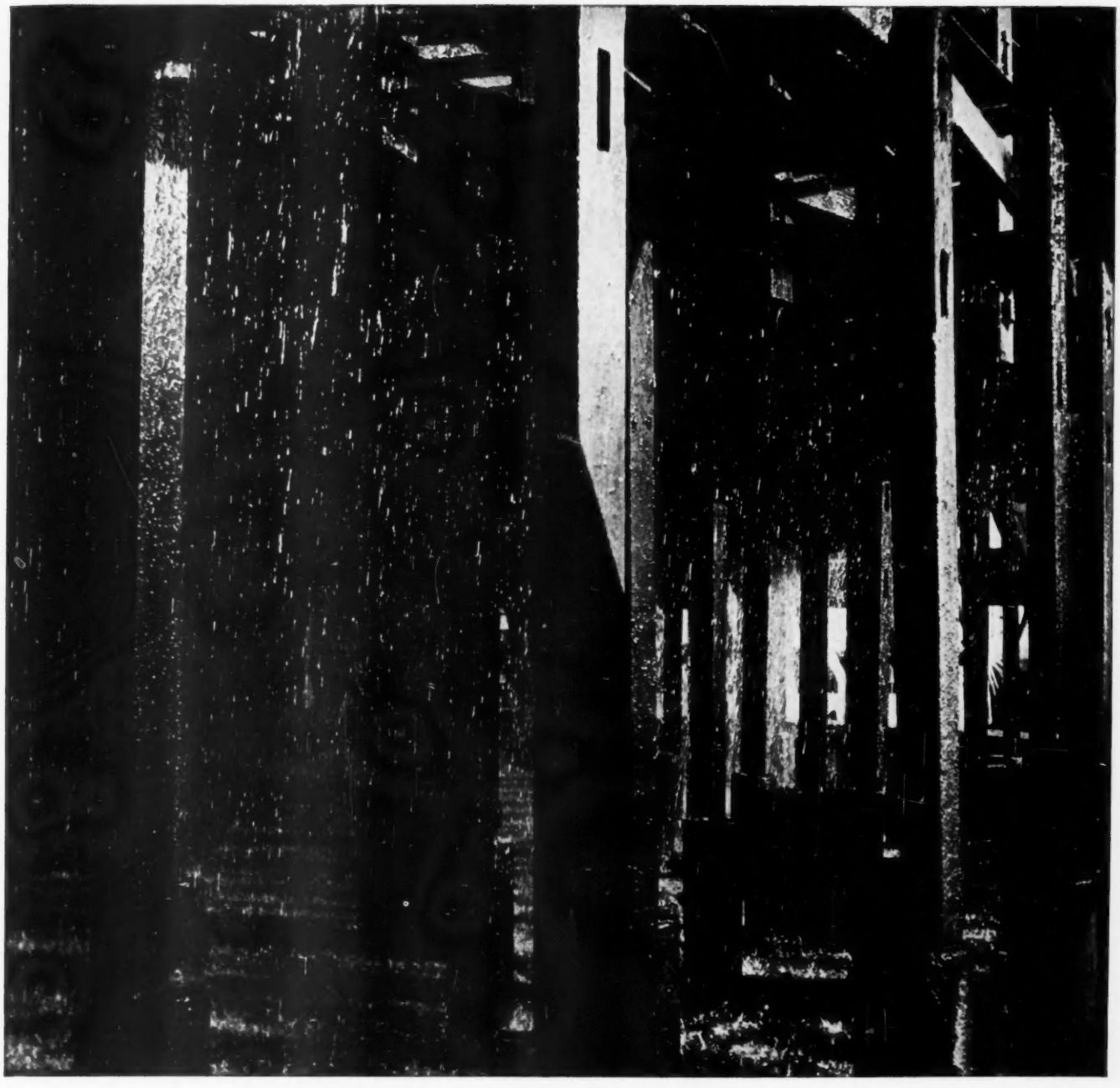

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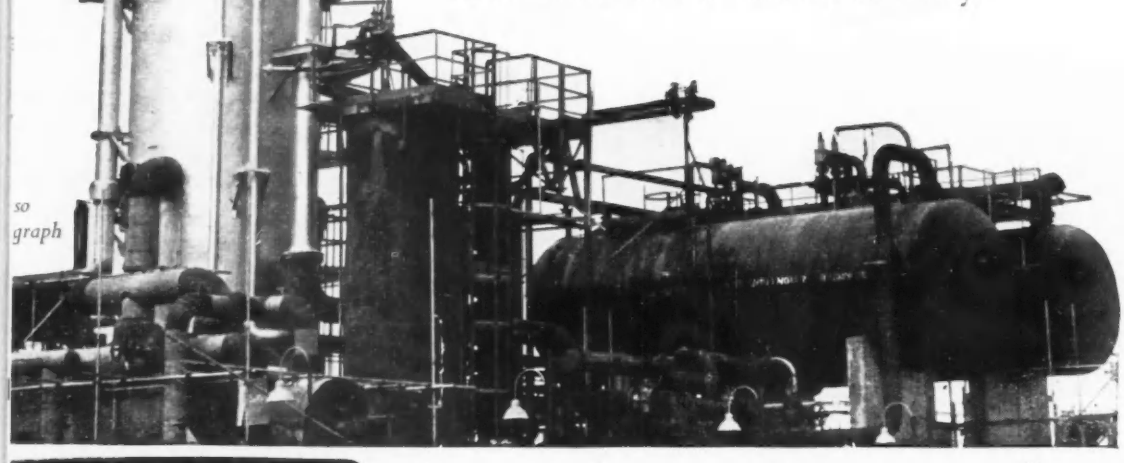

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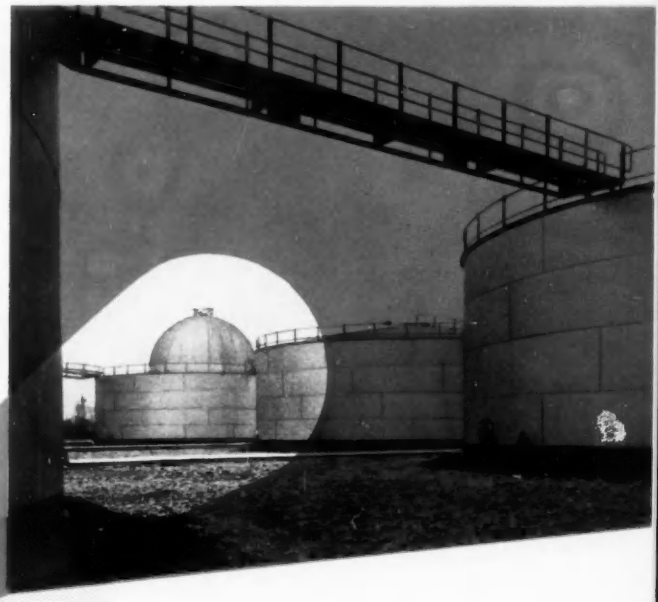

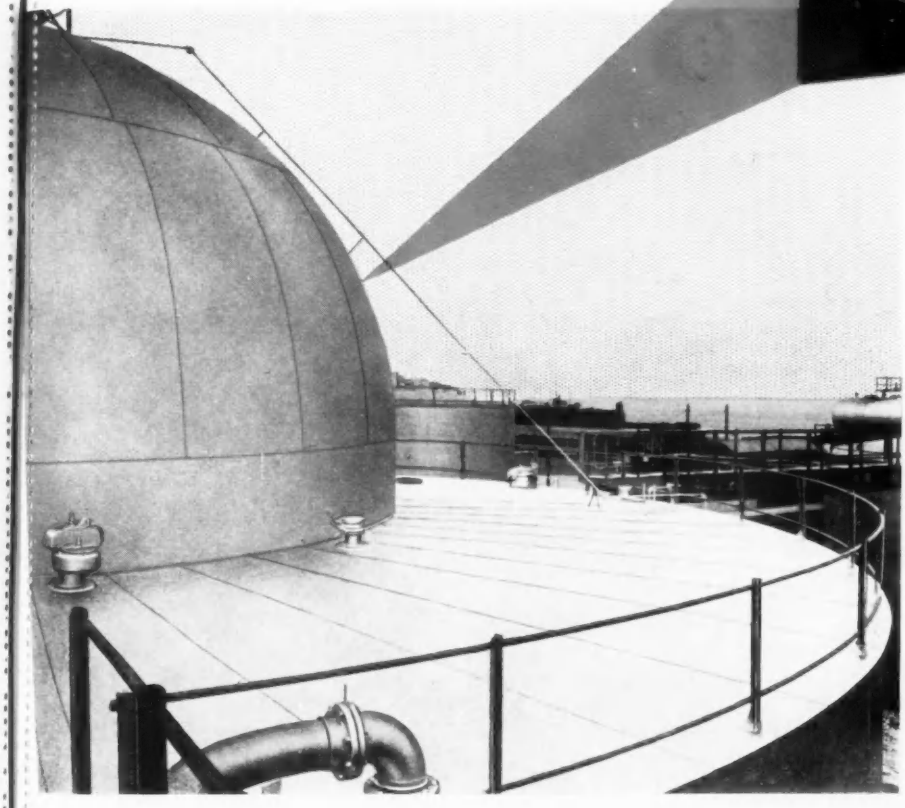

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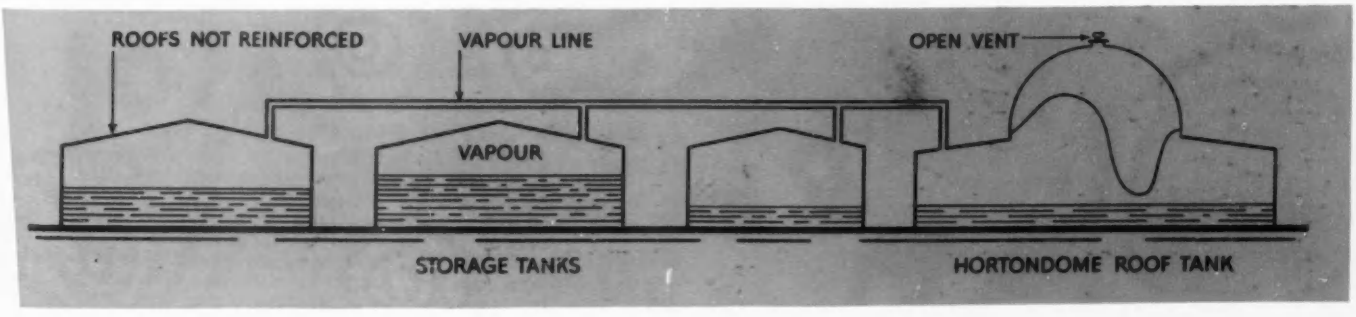


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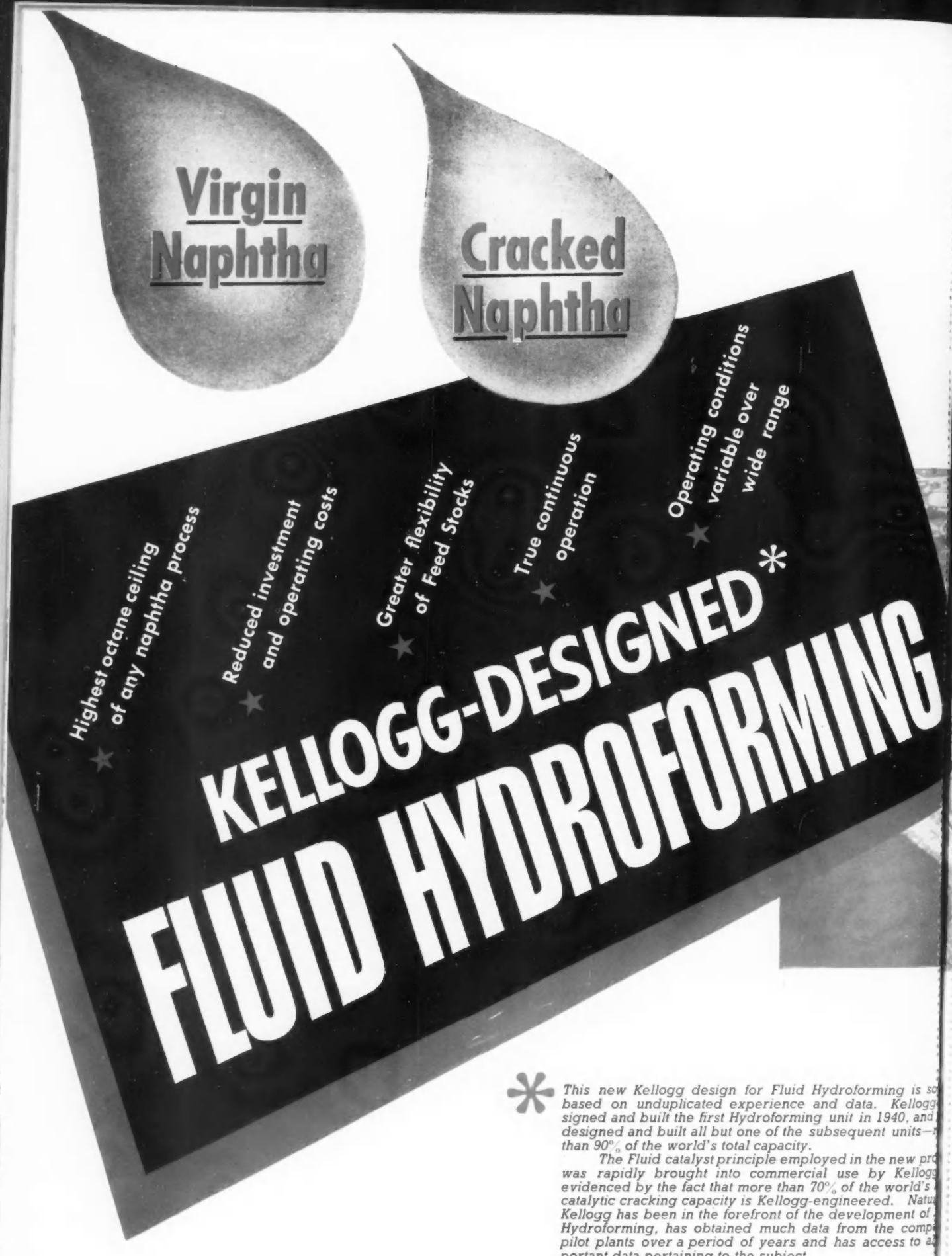


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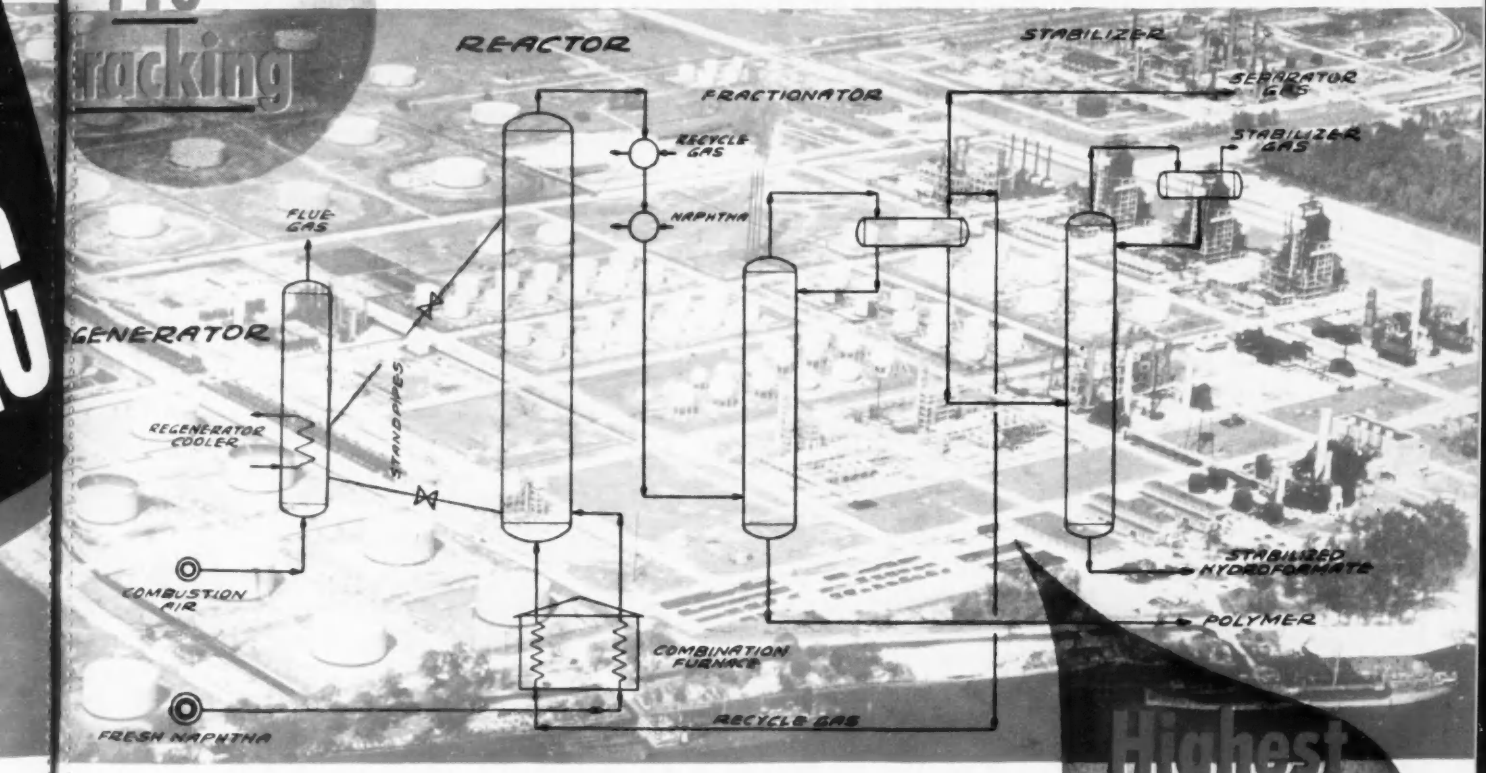


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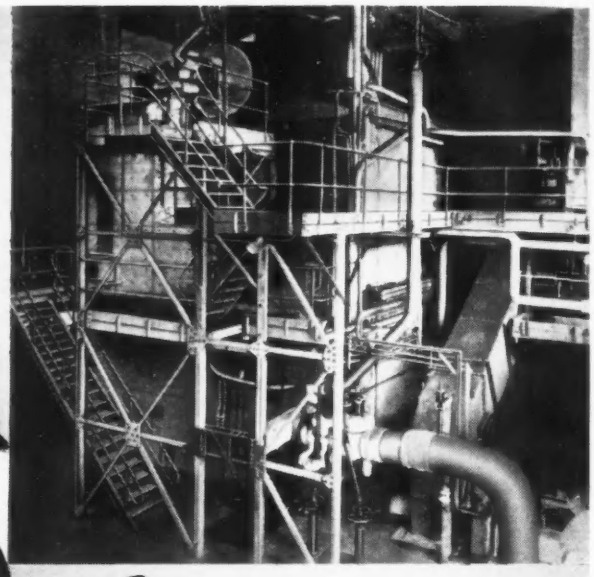

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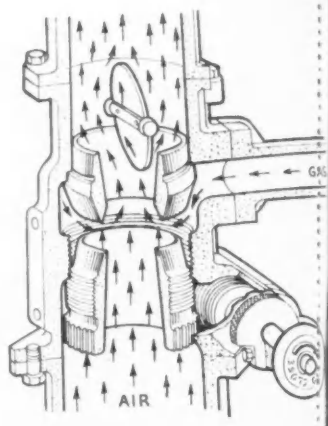


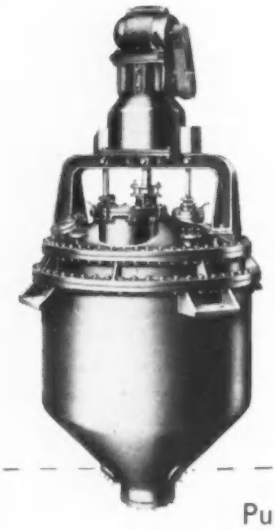

*(Right, above)* Section showing control valve, with fixed and adjustable venturis.

*(Right, below)* Control box with handwheel and scale for percentage of oil and gas.

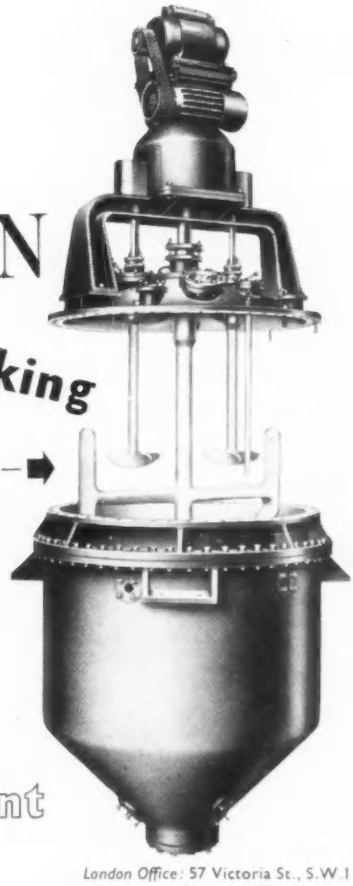
This new refinement has increased further the high efficiency of National gas and dual-fuel engines. They are eminently suitable for running on natural gas and 25 years' experience of this fuel is behind the engines we offer.

*ıtion is of an "R4AP5" type dual-fuel engine, developing 200 b.h.p. at 600 r.p.m. Engines of this series are manufactured with from 3 to 8 cylinders, covering a power range of 120 to 320 b.h.p.*

**NATIONAL GAS AND OIL ENGINE CO. LTD., ASHTON-UNDER-LYNE, LANCASHIR**



# A REPUTATION *in the making*



Purity of product depends on quality of plant. Cannon Cast Iron vessels lined with acid-resisting glass enamel are used for many of Britain's purest products.

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## completed on time and within the budget

ENGINEERING DESIGN
ERECTION MANAGEMENT
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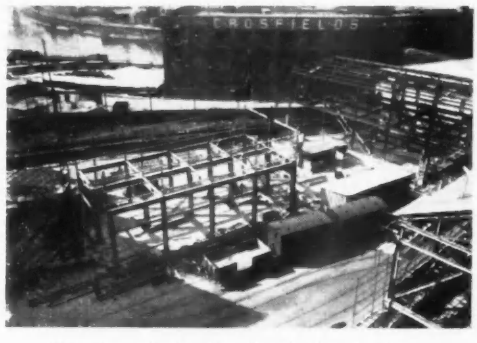
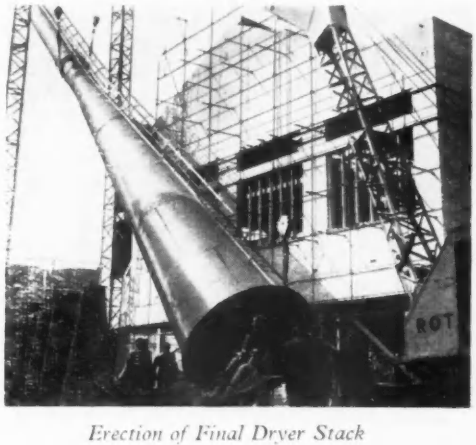
WERE **BADGER'S** ROLES
ON THIS CRITICALLY
IMPORTANT PROJECT




*Erection of Silo Steelwork, foundations for storage tanks and construction of oil fuel tanks*



*Erection of Final Dryer Stack*

E. B. **BADGER** & SONS (GREAT BRITAIN) LTD.
(A SUBSIDIARY OF STONE & WEBSTER ENGINEERING CORPORATION U.S.A.)
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*Process Engineers and Constructors for the Petroleum, Chemical and Petro-Chemical Industries*

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for Strength & Pressure Tightness

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Lake & Elliot Ltd.
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NORTH P.V.C. White Gloves and Clothing afford impermeability to spirits, oils and greases allied to an immense resistance to abrasion. Equally important are light weight, correct comfortable cut, good ventilation and conspicuous ease of cleaning. Available also in drab colour and black. Write now for further details or a sample garment.

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Shell have for many years supplied many grades of asphaltic bitumen to help in the development of the international network of first-class roads. By searching for improvement in method and by rigorously maintaining the high standard of bitumen products, SHELL technicians play an invaluable part in the construction of the world's highways.

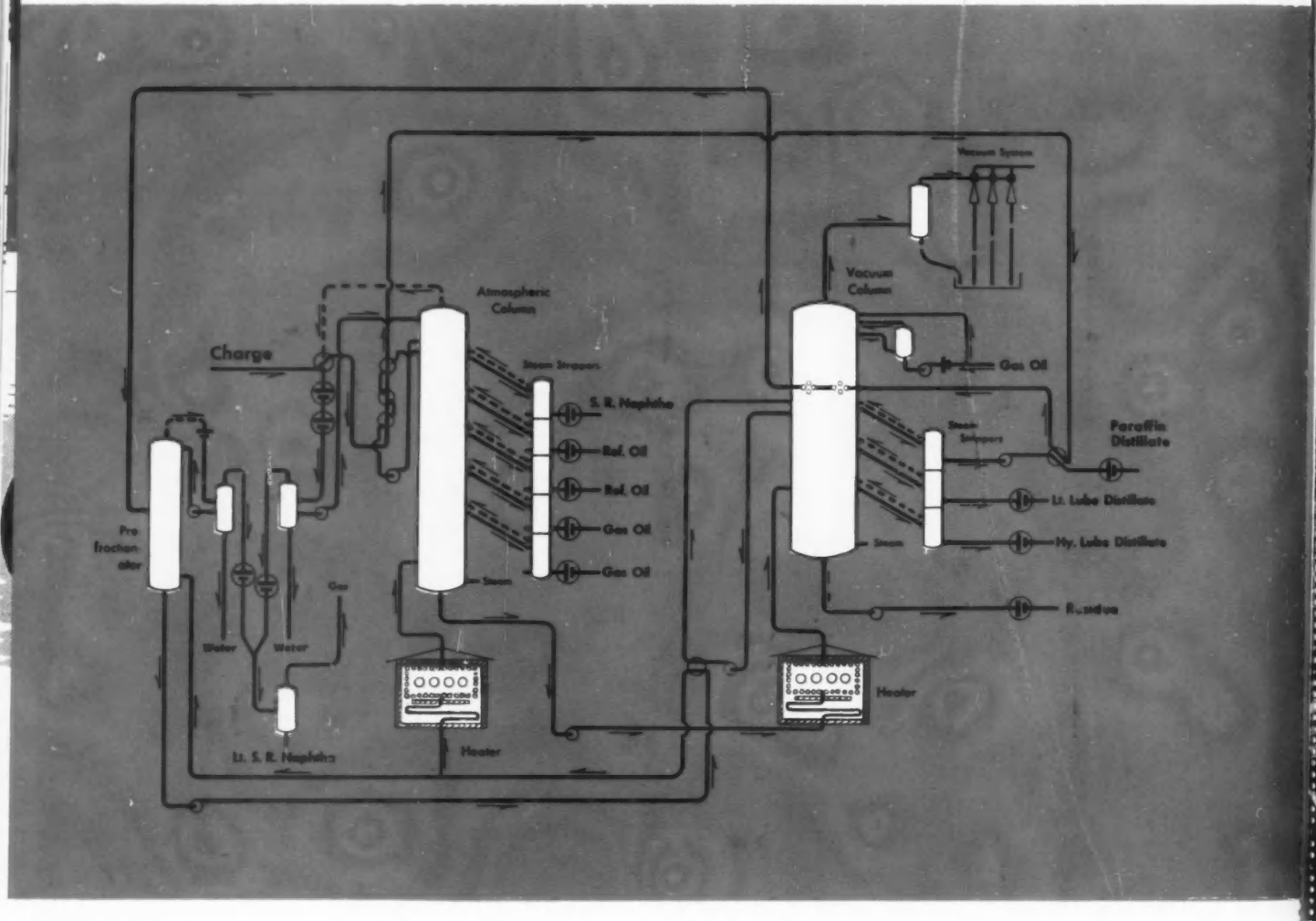
SHELL — *hand in hand with progress*

# Stage Crude istillation Unit

*Prefractionation and the separation of naphthas, refined oils, and light gas oils in an atmospheric column, plus the removal of heavy gas oils and lubricating distillates from the reduced crude in a vacuum column represents the fractionation sequence favoured by most refiners for the distillation of crude petroleum.*

oil, and light gas oil. Further atmospheric distillation of the crud would be attended with a certain degree of thermal degradatio which is not conducive to the production of the highest quality o lubricating distillate ; therefore, the reduced crude from th atmospheric column is further reduced in the vacuum distillatio part of the system to produce the maximum yields of the variou grades of lubricating stocks available in the particular crud charge to the unit.

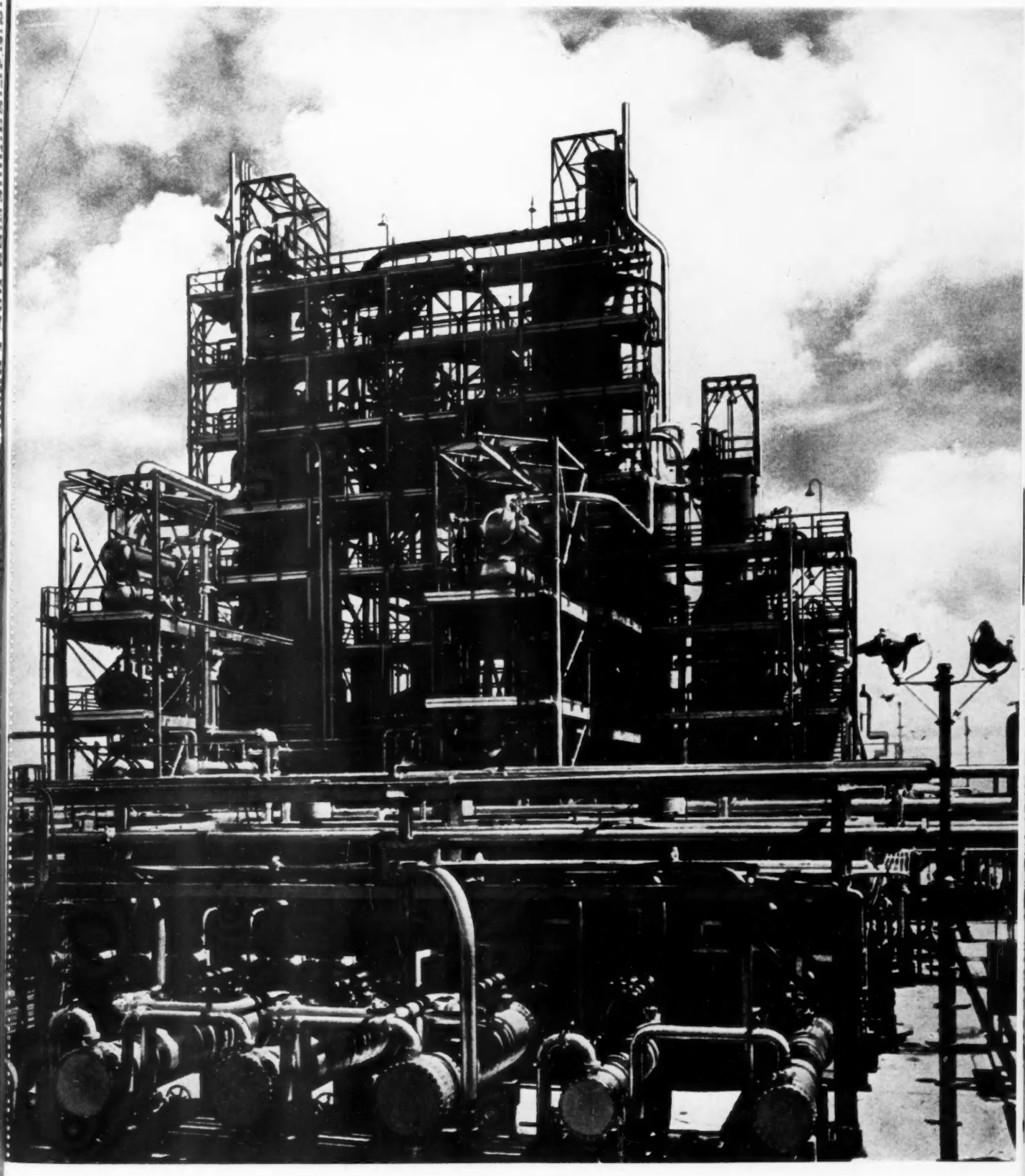
The crude enters the unit through a vapour heat exchanger, the through a series of exchangers where it absorbs heat from circulating intermediate reflux stream from the atmospheri fractionating column. Further temperature increase is obtaine by heat exchange with the paraffin distillate stream from th vacuum column ; the crude stream then passes through tubebundle located in the vacuum tower. The crude stream, so preheated then enters the prefractionating tower. After flashing off hydroge sulphide, water and a light naphtha fraction the partially reduce crude from the prefractionator is pumped through a heat exchang




tionation flashes-off from the crude hydrogen sulphide and thereby concentrating the low-temperature sulphur corrosion n to one small section of the entire unit. It also removes ıter fractions from the crude thereby increasing top of tower ature in the atmospheric column and avoids steam con- on therein. The heat required for the prefractionator is d almost entirely by heat exchange.

nospheric distillation part of the system removes from the at normal temperature, the remaining naphtha, the refined

where it absorbs heat from a circulating intermediate reflux the vacuum tower ; then passing to the " Downdraft " heat where it is raised in temperature to effect vaporisation of t remaining naphtha, the refined oils and light gas oils. The reduc crude from the atmospheric tower is pumped directly to anoth " Downdraft " heater where it absorbs sufficient heat to effe vaporisation of the remaining gas oils and the light and hea lubricating oil stocks, which are then fractionally separated the vacuum tower.



Foster Wheeler

LONDON NEW YORK AND PARIS

*This Three-stage Crude Distillation Unit, recently placed in op was designed to charge 48,000 bbls. per day of High Sulphur Preflashing, chemical treatment and alloy protection are prov minimise corrosion.*

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reducing friction, preventing welding,
washing away swarf and, not least, keeping
the workpiece cool. Our picture
shows how a soluble oil emulsion inundates the
workpiece as it undergoes cylindrical
grinding at high speed.

SHELL produce many grades of both straight
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widely employed in all types of
cutting and grinding operations.

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for Strength & Pressure Tightness

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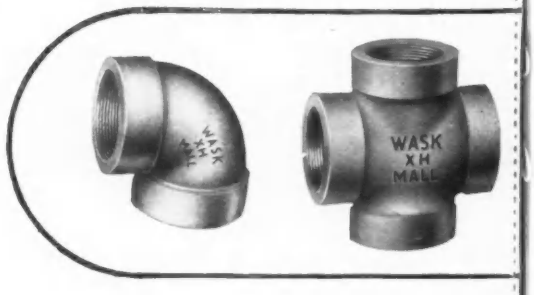
)VER 25 YEARS' WASK UNFAILING SERVICE




**WHITEHEART MALLEABLE CAST IRON FITTINGS**

$\frac{1}{8}$" to 10" SIZES
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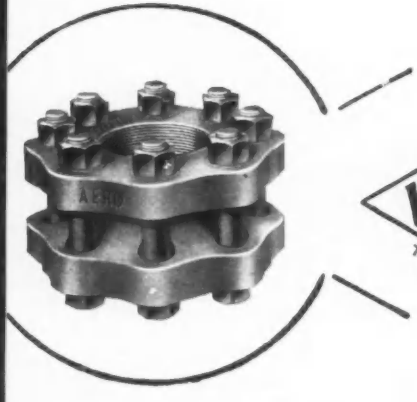
SPECIALITIES—Emergency pipe clamps, wing unions, check valves, strainers, drainage fittings, etc.

**FORGED STEEL**—2000 lbs. 3000 lbs. 6000 lbs. Series. Screwed or Socket Weld Fittings, Unions, etc.



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Insoluble in oil or petrol, Avarc Graphite Bond makes the perfect joint on lines carrying hot or cold oil. Avarc makes a good tight joint for screwed or flanged connections, and is specially recommended for heading up Tube Stills. It never becomes hardset—can be opened years later!

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Over a period of many years the James Walker organisation has built up a reputation for its products that is second to none.

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*The uniform of a Captain when Lord Nelson was adding lustre to the 'Tradition of Service' of the British Navy.*

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*famous the world over*

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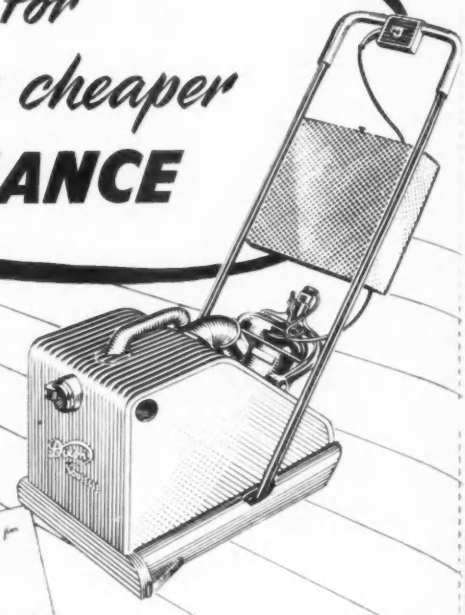

v floor maintenance technique is positively
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nbus-Dixon mechanized floor maintenance, as well as
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hygienic and safer floors than ever before, with cleaner,
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THIS BOOKLET tells you HOW
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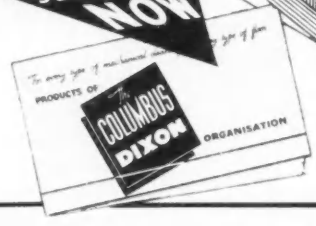


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*An Organization Specialising in Power Floor Cleaning Equipment for every purpose in Industry.*

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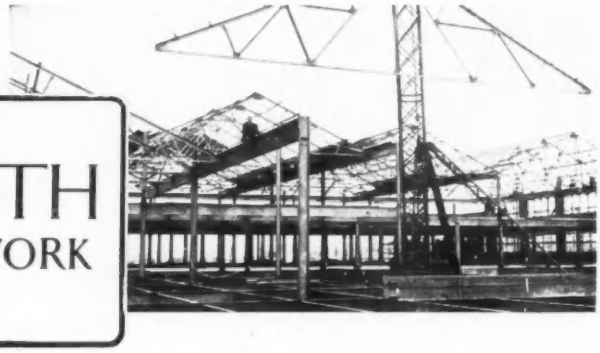

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STEELWORK

STRUCTURAL STEELWORK—STEEL ROLLING SHUTTERS AND FIREPROOF DOORS—
WELDED STEEL TANKS—STEEL AND GLASS PARTITIONS, &c.

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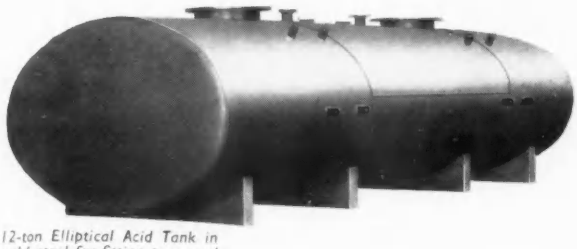
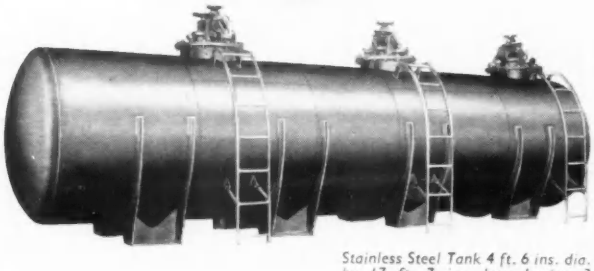
JOHN BOOTH & SONS (BOLTON) LTD HULTON STEELWORKS, BOLTON

LONDON: 26, VICTORIA STREET, WESTMINSTER, S.W.1. Telephone: ABBey 7162.

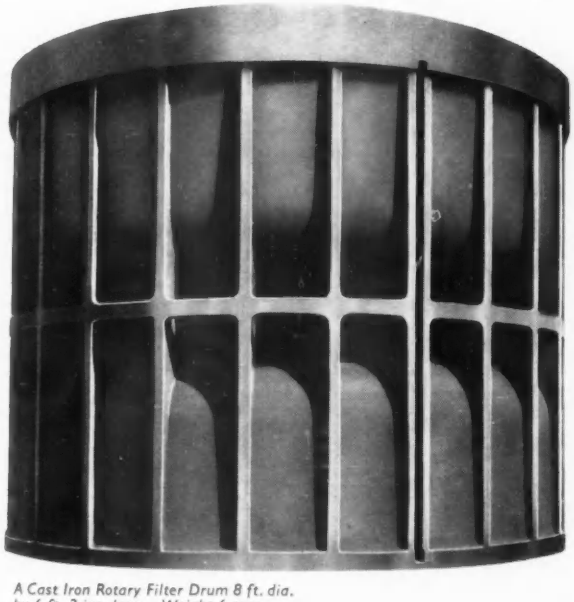


12-ton Elliptical Acid Tank in mild steel for fitting to a road vehicle. Dimensions 15 ft. 8 ins. long by 5 ft. 9 ins. wide by 3 ft. 9 ins. deep.

Large Compressor Cylinder Casting, 7 ft. high by 6 ft. 8 ins. wide by nearly 3 ft. deep. Weight 98 cwts.



Stainless Steel Tank 4 ft. 6 ins. dia. by 17 ft. 7 ins. long having 3 compartments and arranged for mounting on a road vehicle.



A Cast Iron Rotary Filter Drum 8 ft. dia. by 6 ft. 3 ins. long. Weight 6 tons.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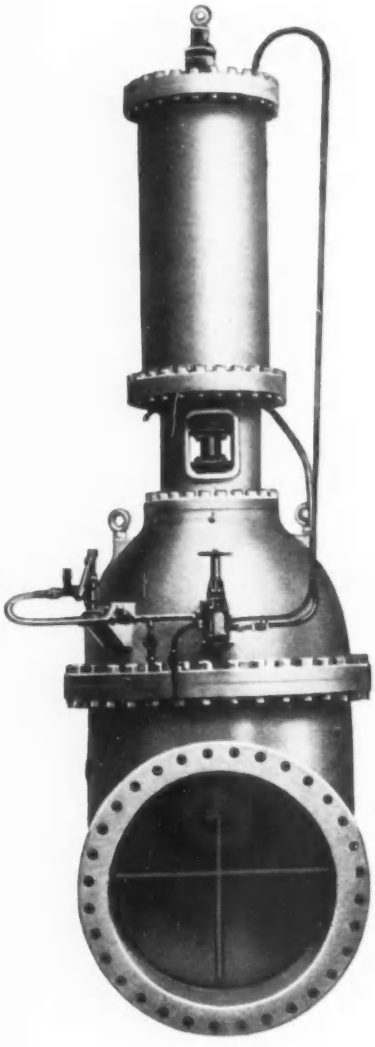

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**600 lbs. per sq. inch**

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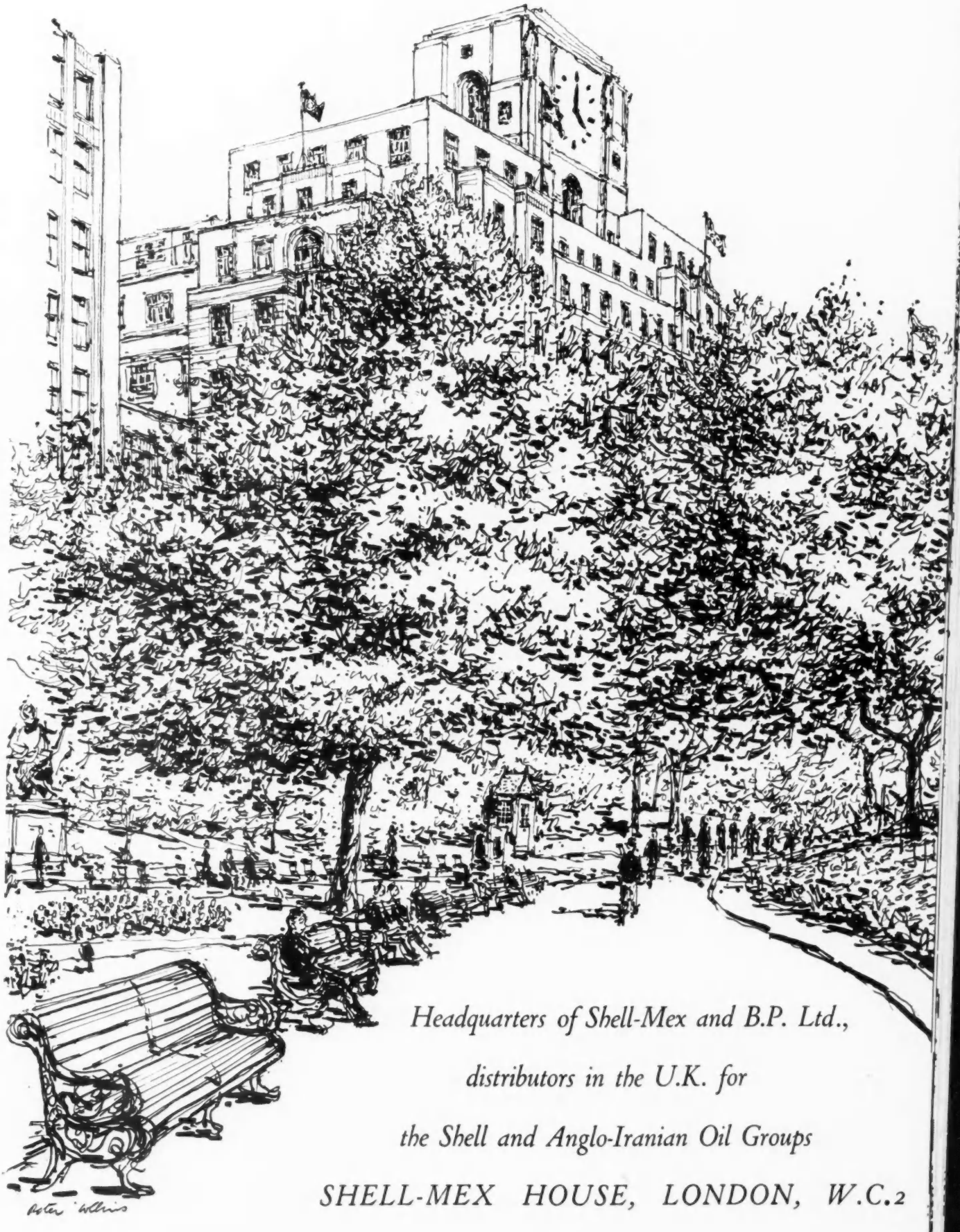


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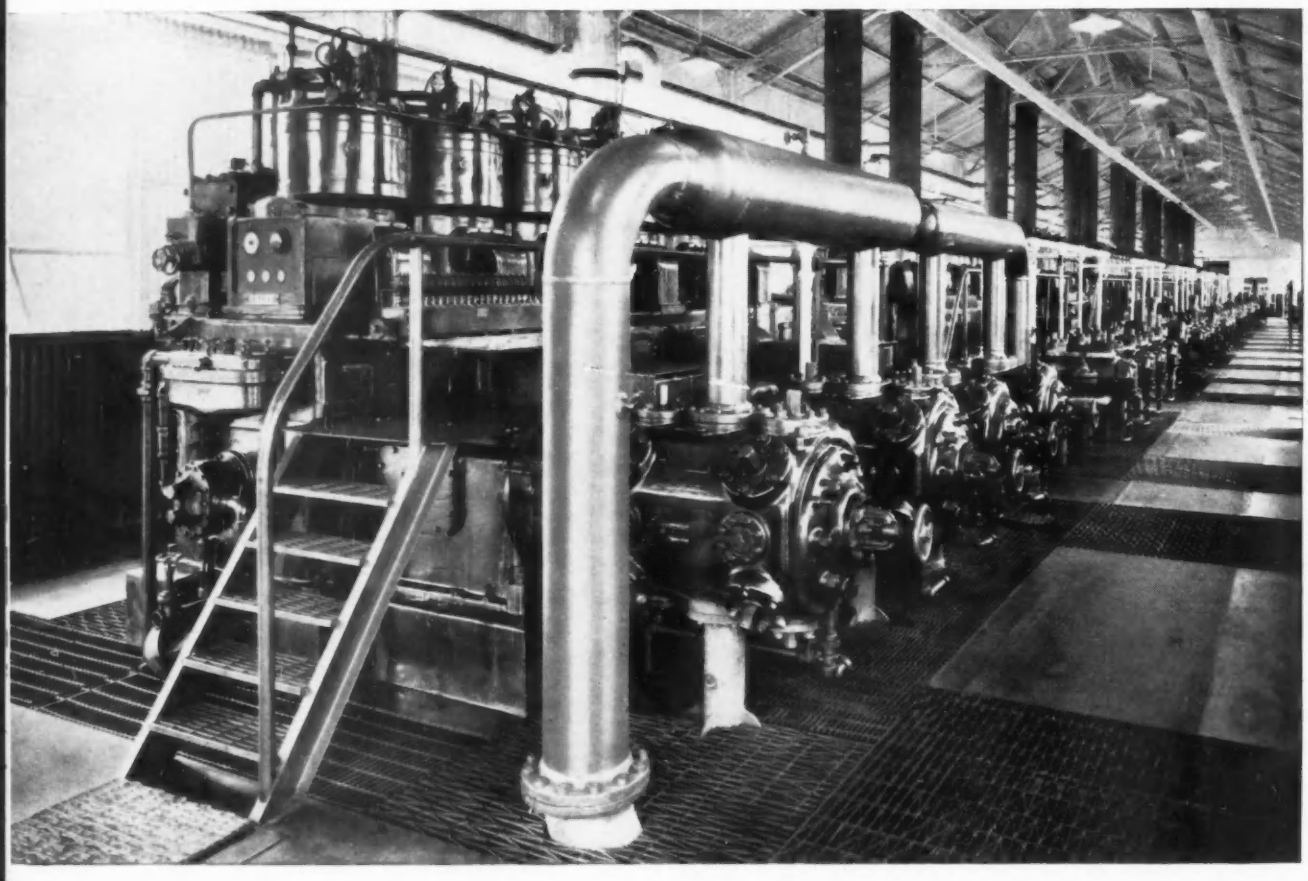
# a mere .013" of power cylinder wear after 10 years' full-load operation



# ...that's Clark quality for you!

**Clark "Right Angle" Compressors set remarkable record in Lion Oil Company operated Shuler Unit Natural Gasoline and Pressure Maintenance Plant**

Power cylinder wear of less than .00125" per year after initial break-in! Total average wear of .013" per cylinder for the whole 10-year period!

. . . that's the remarkable record of six Clark RA-6, 600 bhp Right Angle, Gas-Engine-Driven Compressors operating continuously at full load since 1941 in Shuler Unit, Arkansas natural gasoline and pressure maintenance plant which is operated by Lion Oil Company.

But that's not all that's remarkable about this installation. The original power piston rings were in service for 8½ of those years before needing replacement.

Two other Clark RA-6 units operating since 1943 and 1948 respectively, are showing the same unusual resistance to wear . . . the same extremely low maintenance.

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*One of the Dresser Industries*

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COMPRESSOR SPECIALISTS

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*There's a BIG Difference in...*

**CLARK**
**compressors**

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"Kencrete" is a light-weight, highly efficient fire-proofing material for the fire protection of structural girders, vessels, etc.

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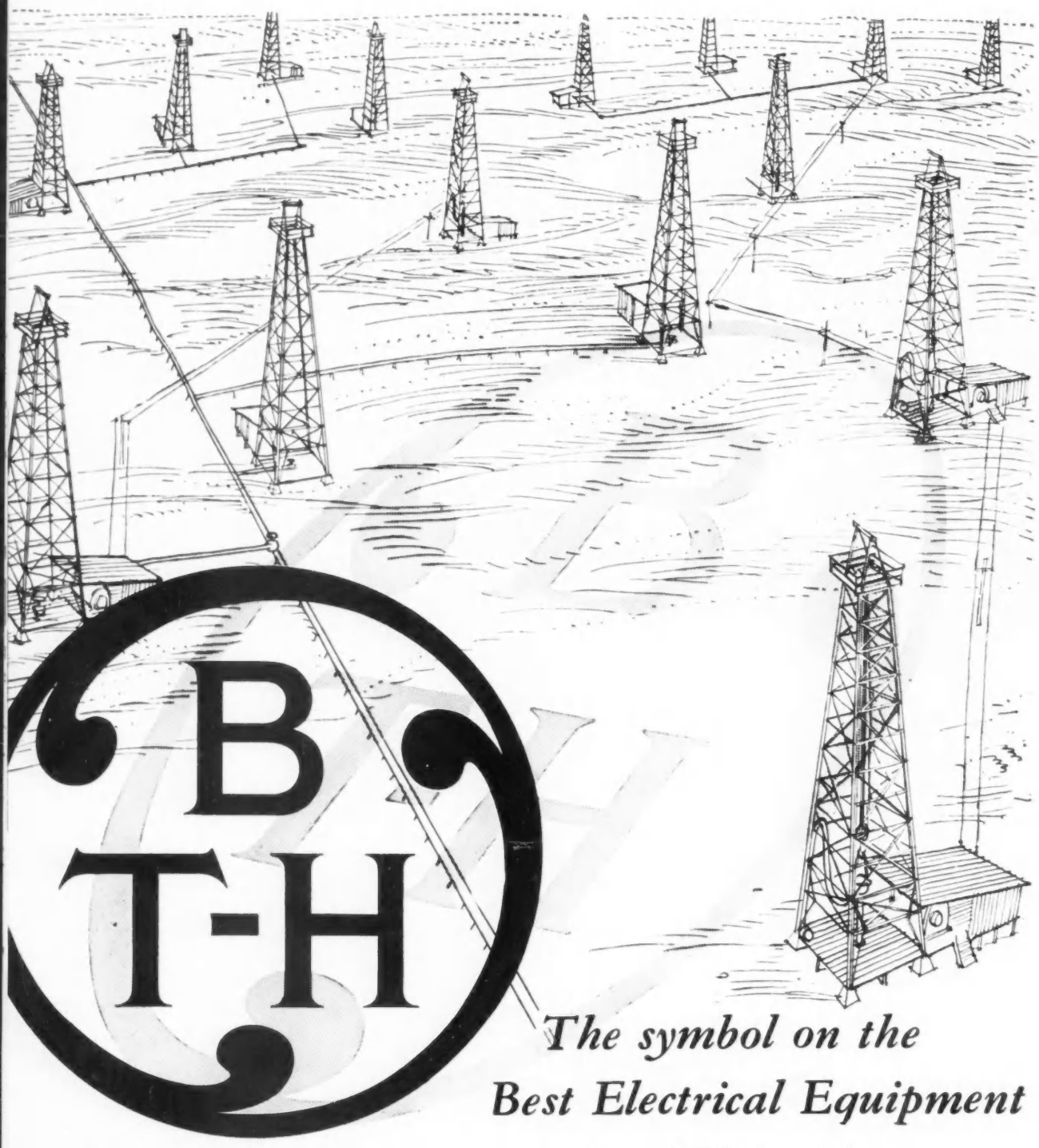


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*Best Electrical Equipment*

Hard and continuous service is demanded of any electrical equipment in the oil industry. That is why in the fields so many of the generators, motors, starters, and other devices bear the initials BTH—symbol of sound design and of guaranteed reliability in service.

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National Pumping Units are built that way—in a range of sizes for every pumping operation, and ready for service in any climate.

They're built that way because National's research and product development programs are completely integrated with the requirements of operators in every major oil field throughout the world.

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*Some standard lines:-*

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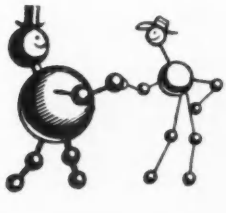
*It's a matter of molecular structure . . .*



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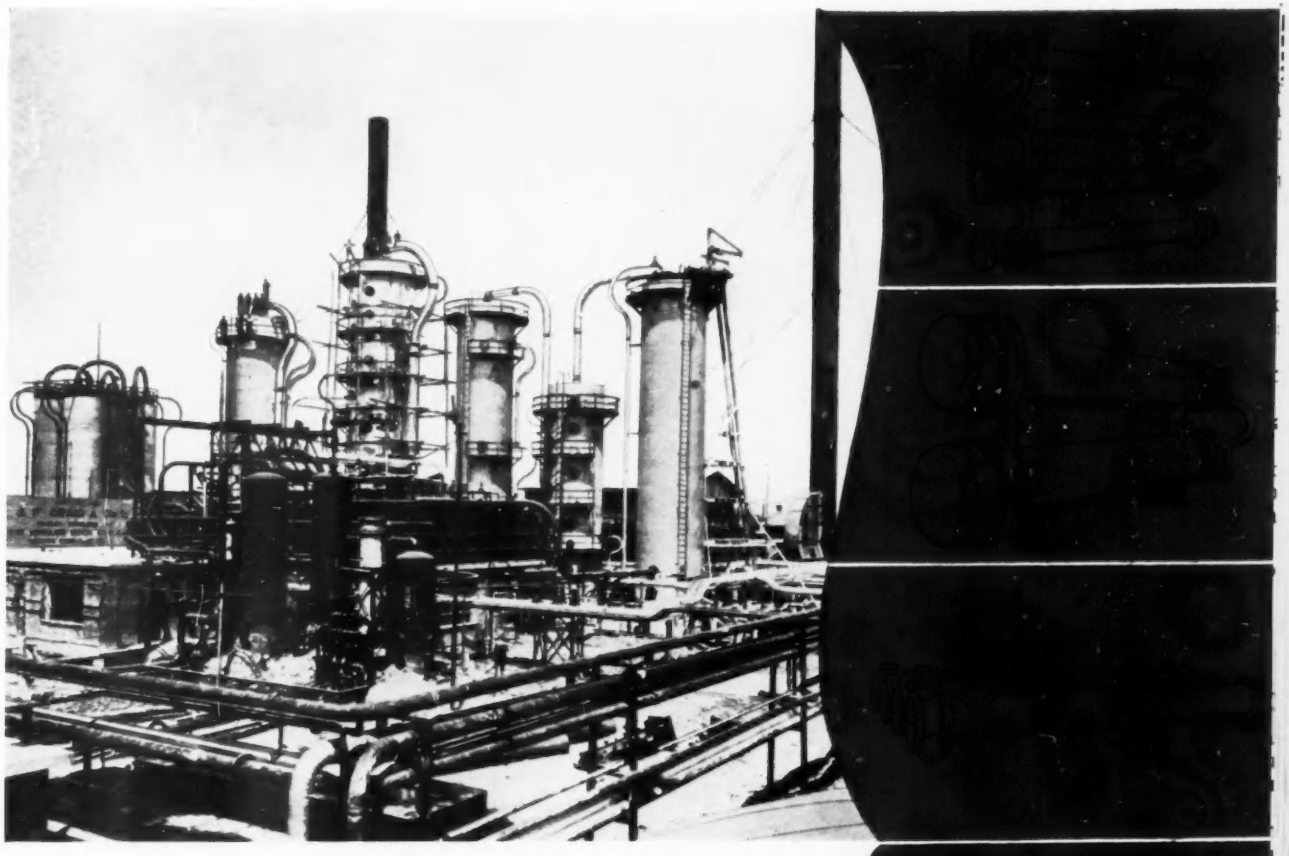

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# Foam Compound News

## Some facts about the development of fire fighting foam

Foam Compounds have been developed from time to time, in accordance with the particular type of mechanical foam equipment in vogue.

Some foam compounds give good foam with one type of equipment ; and bad foam with another ; but a good-looking foam is no measure of its usefulness on a fire, because its fire resistance cannot be determined by visual examination. The development of mechanical foam equipment has been, in the main, along two broad lines, each fundamentally different in the principles of foam production :—

(*a*) Foam Pumps.

(*b*) Foam-making Branchpipes and Mechanical Foam Generators as produced by The Pyrene Company, and used in many ways from portable, hand-operated appliances, to the largest sizes of fixed units for Oil Storage Tank Protection ; and for Foam Tenders for Oil Refineries and Storage.

Foam pumps are of the positive, rotary type and generally based upon the Danish designs of Schroder and Van Deur and Ellehammer. These power-driven units take in water, foam compound and air in controlled proportions, beat the mixture into a foam and pass it through an improver on the way to the delivery.

The Pyrene Foam-making Branchpipe (or generator) operates from a supply of pressure water, and this in turn induces foam compound and air, forcibly mixing them together to produce foam. The size of a unit is limited only by the capacity of the water supplies available.

## Fire - resistant foam

Almost any type of foam compound can produce a good-looking foam which may, or may not, have fire resistance when used in conjunction with foam pumps, largely because of the mechanical power available from the motive unit. For use with the foam-making branchpipe a more selective, and much more refined, foam compound is necessary to give good results.

Omitting details of the intervening development years, there are now two types of foam compound, which are best described as " Standard " and " Low Viscosity." As the original makers of foam branchpipes and foam compound in this country, it will be appreciated that the special grade of foam compound which we developed, and which in fact we still produce, has properties and a viscosity to suit the operating conditions under which our equipment will be used, and this grade is known as " Standard."

It was found, eventually, that this compound also gave having all the required properties, including that of fir tance, when used with foam pumps.

It was known to us that the size of the foam compound lines on air foam pumps was not large enough to carr compound adequately of the viscosity of the Pyrene "Sta grade. To meet this condition we therefore developed ou " D " or " Low Viscosity " compound and have suppl for many years, and are still supplying it in large quan the Government Departments concerned.

## Animal blood compound

In the early days of the war the Chemical Research Labo Department of Scientific and Industrial Research inve the raw material position of foam compound, with a finding a home supply as an alternative to an imported p They eventually issued a specification which would manufacture of foam compound from animal blood, b low viscosity, in order to meet Service requirements of foam pumps. This was a useful wartime precaution b Pyrene Company never found it necessary to depart fro original product except as mentioned above for use in a pumps.

Blood compound to the C.R.L. specification has no commercialised and has become an available supply.

## The advantages of Pyrene " Standard " Foam Compou

The Pyrene Company still adhere to their original " Sta viscosity as being the best type for use in their equ One major advantage of using " Standard " viscosity co is that a substantially less quantity will be used in foam pipes and mechanical foam generators during a fire, th serving manpower and transport and reducing the nu empties to be disposed of.

The viscosity figures of foam compounds are as follows

| | | |
|---|---|---|
| Pyrene " Standard " Grade :— | 30-centistokes at 20 | |
| Pyrene Grade " D " :— (Low Viscosity) | 10- | " " |
| Others :— | 10- | " " |

The Pyrene Company have made tests with their norma ment, to demonstrate this fact, with the following result

| | Water g.p.m. | Pyrene Std. Comp. g.p.m. | Pyrene Grade " D " g.p.m. | Other L.V. Comps. g.p.m. | In of L |
|---|---|---|---|---|---|
| Pyrene F.B.10 Branchpipe ... | 94·5 | 5·4 | 6·4 | 6·4 | |
| Pyrene M.F.G.10 | 126 | 4·6 | 5·5 | 5·5 | |
| Pyrene Pro-portionator ... | 103 | 4·4 | 5·4 | 5·4 | |
| Pyrene Inline Inductor ... | 90 | 4·7 | 5·6 | 5·6 | |
| Pyrene Multiple Jet Inductor | 95 | 3·5 | 4·3 | 4·3 | |

The above figures are of the utmost importance to Pyrene Mechanical Foam Equipment.

Taking as a basis that, under ordinary operation co 19 23% more L.V. compound would be used than wou case with Pyrene Standard, this would mean the actua compound used would be 20% greater. 20% more co would have to be transported to the site and manhandl and stocks of L.V. held would only represent 80% of extinguishing capacity of Pyrene " Standard " Foam Co

*Issued by*
**THE PYRENE COMPANY LTD.**
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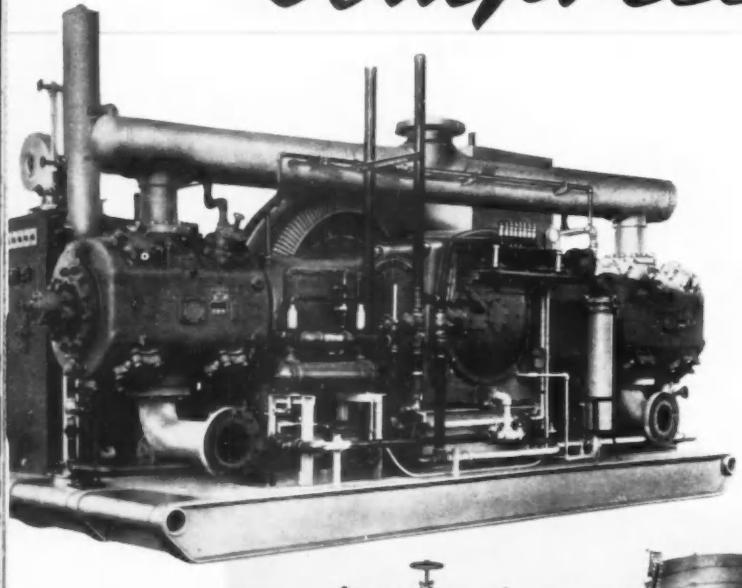
London, S.W.1.

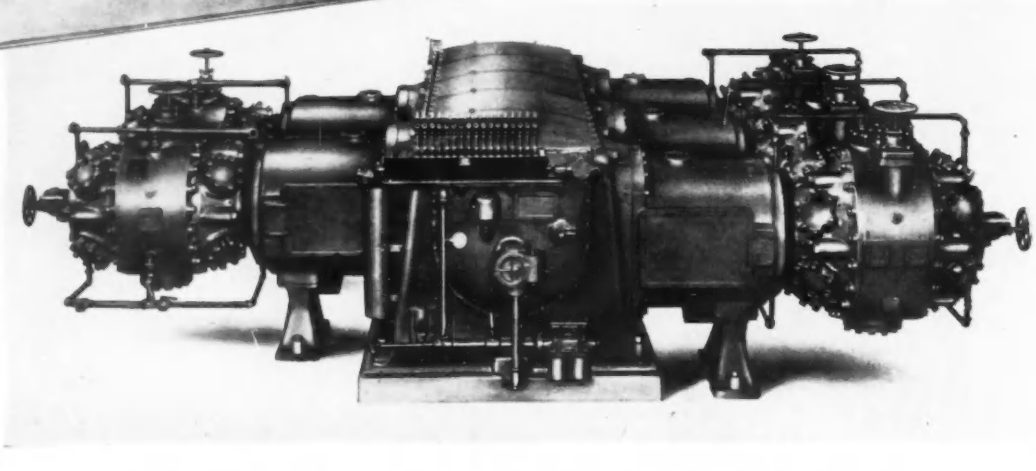
# H&W - COOPER - BESSEMER

## *Compressor Units*



**ELECTRICALLY-DRIVEN COMPRESSORS SUITABLE FOR COMPRESSING ANY KIND OF GAS TO ANY DESIRED STEP OF PRESSURE UP TO A MAXIMUM OF 6,000 LBS. PER SQ. IN.**

*ustration shows electrically-driven nted compressor FM-2. This unit y self-contained, n power supply.*



*A 5-cylinder JM type compressor set adaptable for any type of independent power drive. These units can be supplied with any number of cylinders consistent with a maximum number of six crankthrows, to meet customers' requirements.*

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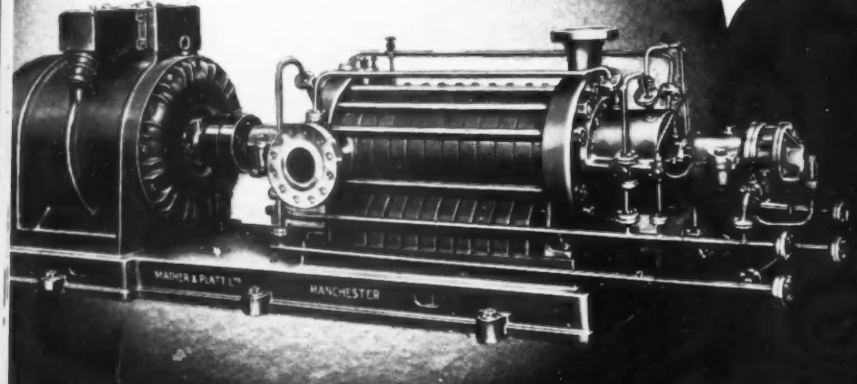


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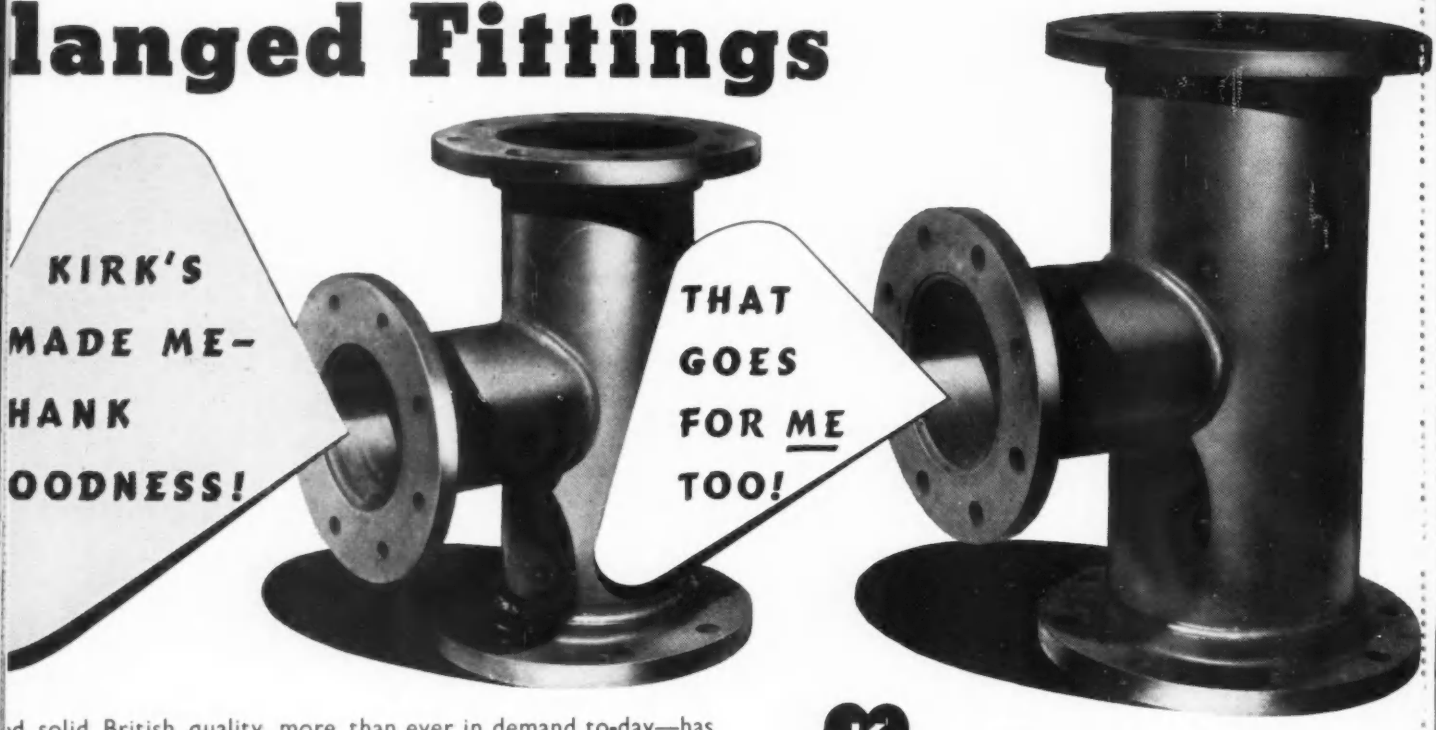


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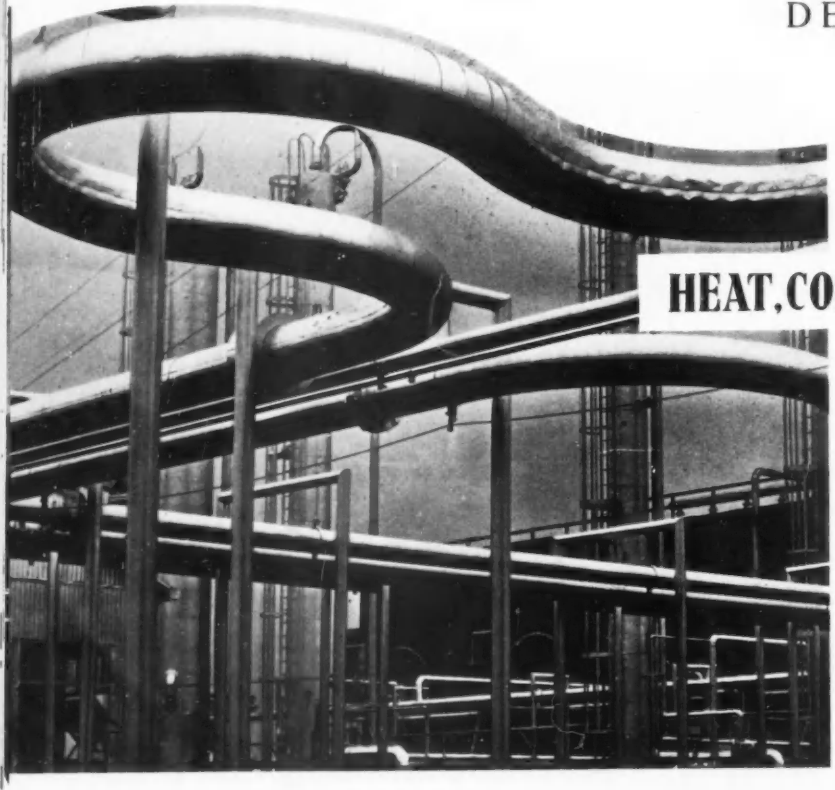

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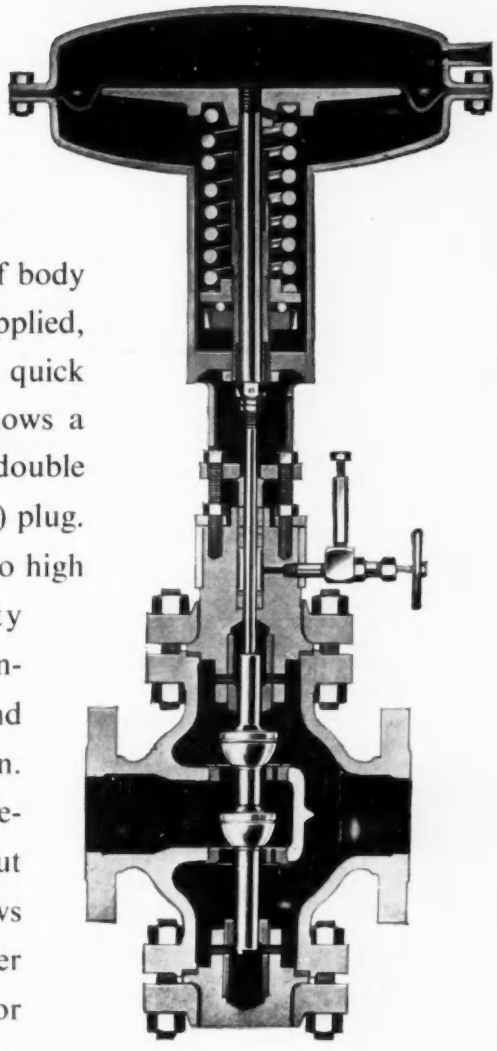

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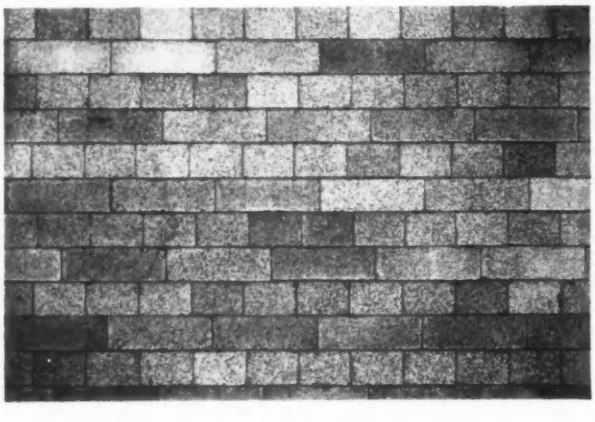

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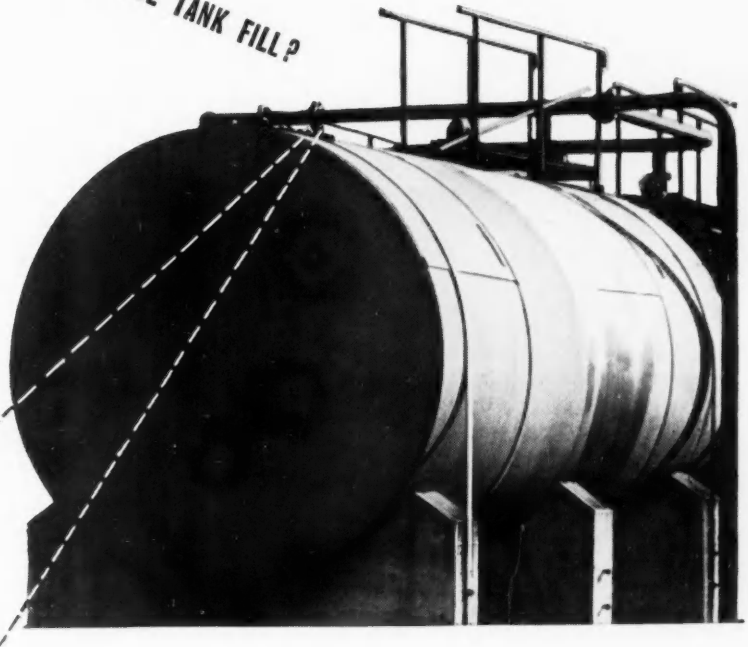

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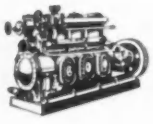

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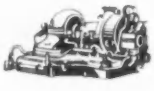

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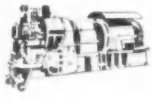

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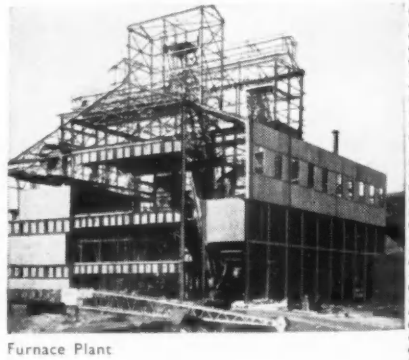

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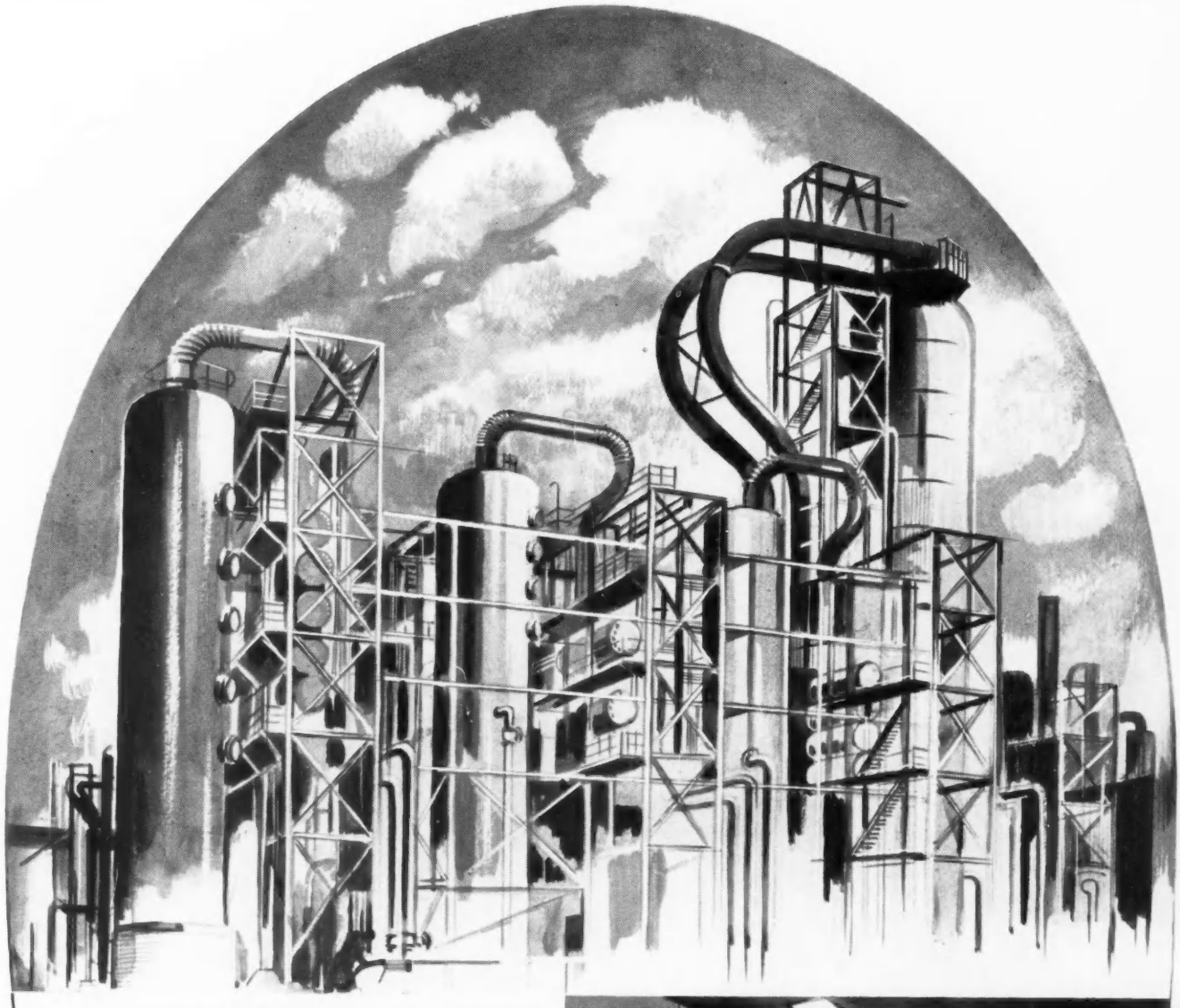

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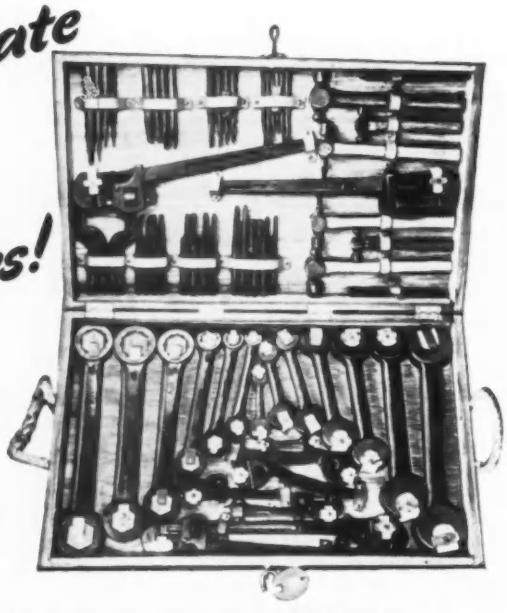

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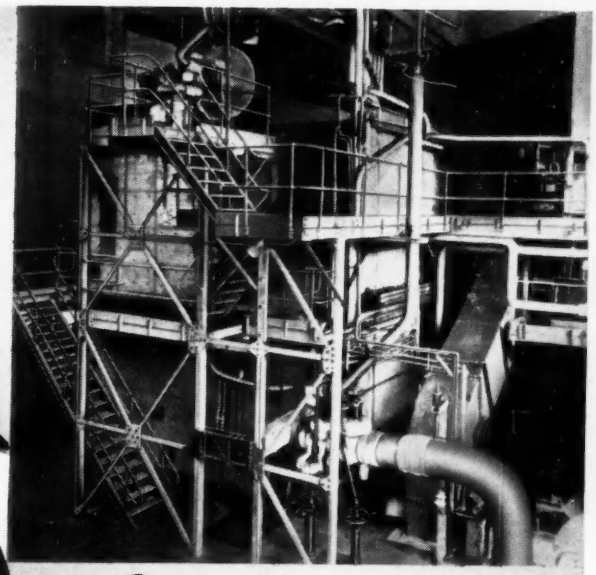

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# NEWCOMER

## THE D180 GUN METAL GATE VALVE

Industry, ever on its toes to speed up output, demands valves which require minimum attention during service. Crane, equally up-to-the-minute, announce their new D180 Valve which, with its nickel alloy disc, particularly meets the latest requirements. Write for Leaflet No. 382

**D180 Gun Metal Gate Valve,** union bonnet construction, rising stem, suitable for saturated steam working pressures up to 200 lbs., 500° F., sizes ¼" to 2", screwed ends. This valve has a Crane Nickel Alloy disc; the body seat rings are integral with the body. A feature of the bonnet construction is that the union ring nut provides a strong tight joint; it can be easily dismantled and reassembled without danger of injuring the valve.

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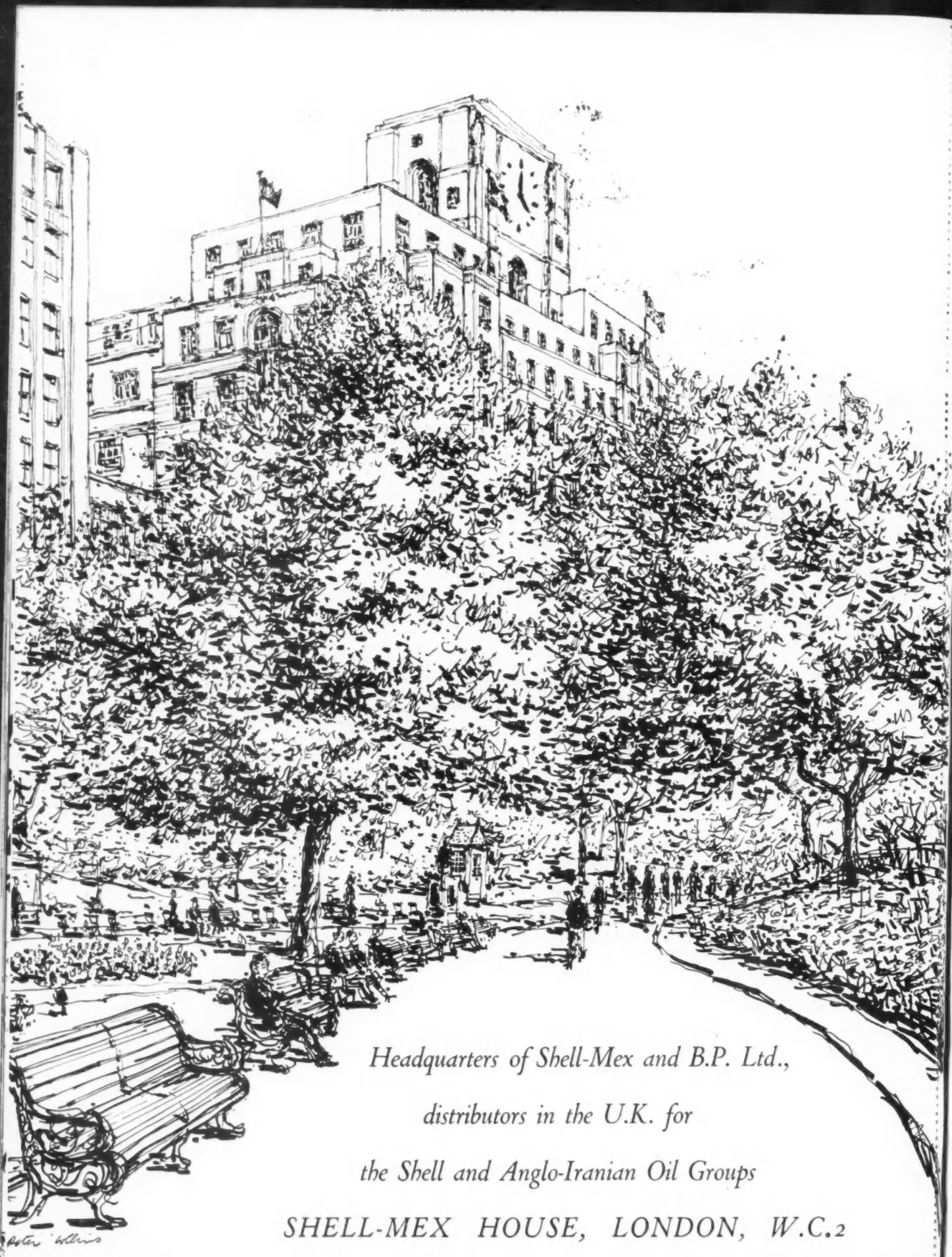

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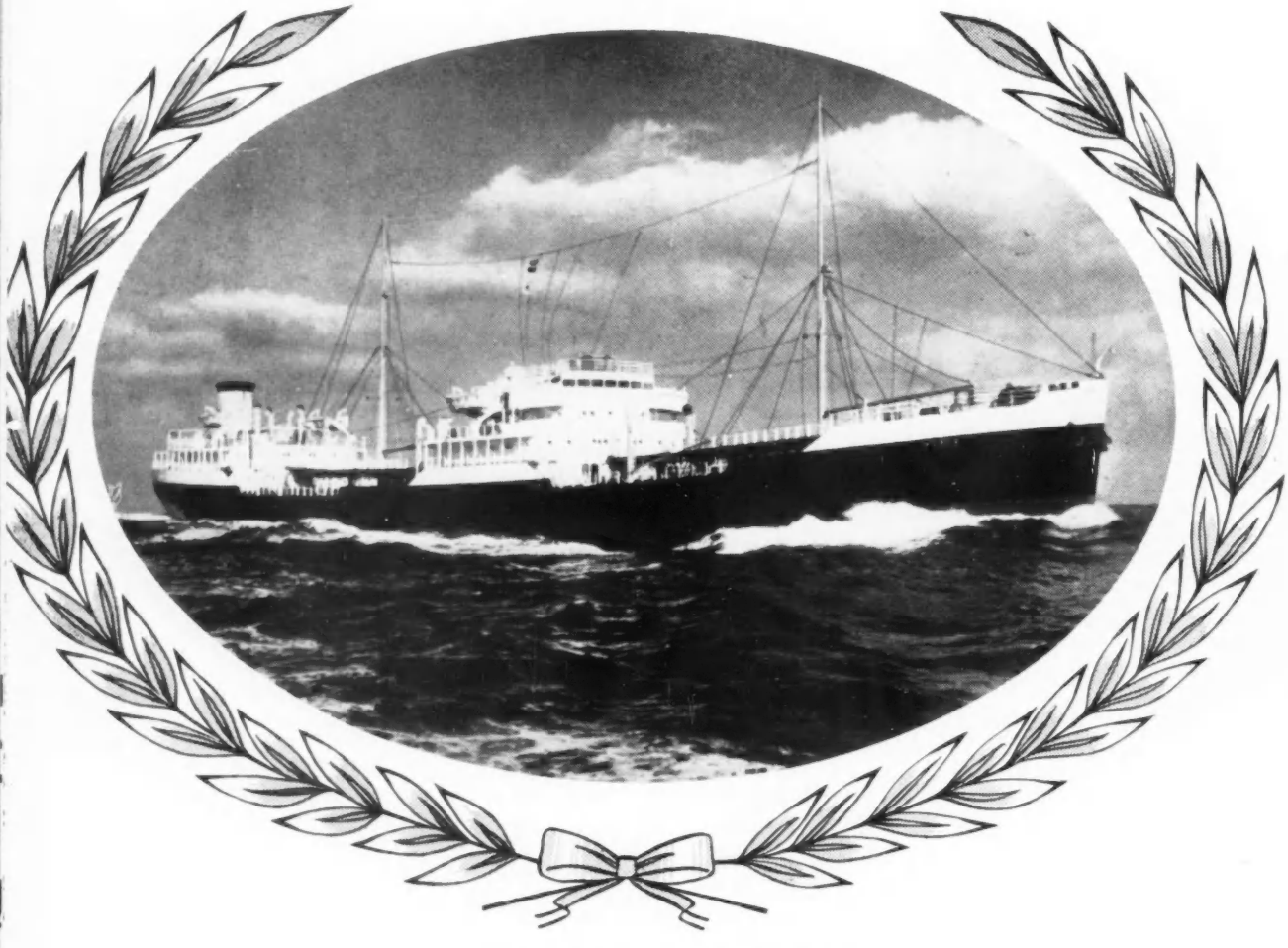

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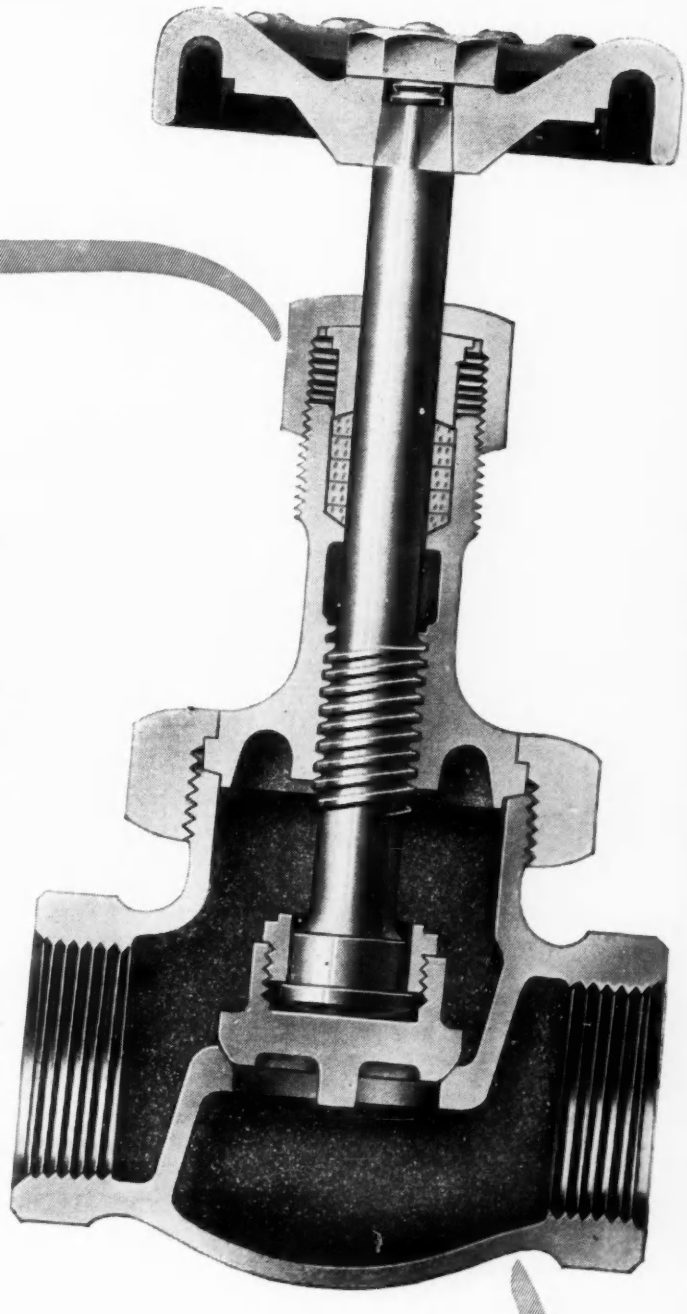

# New

## THE D17 GUN METAL REGRINDING GLOBE VALVE

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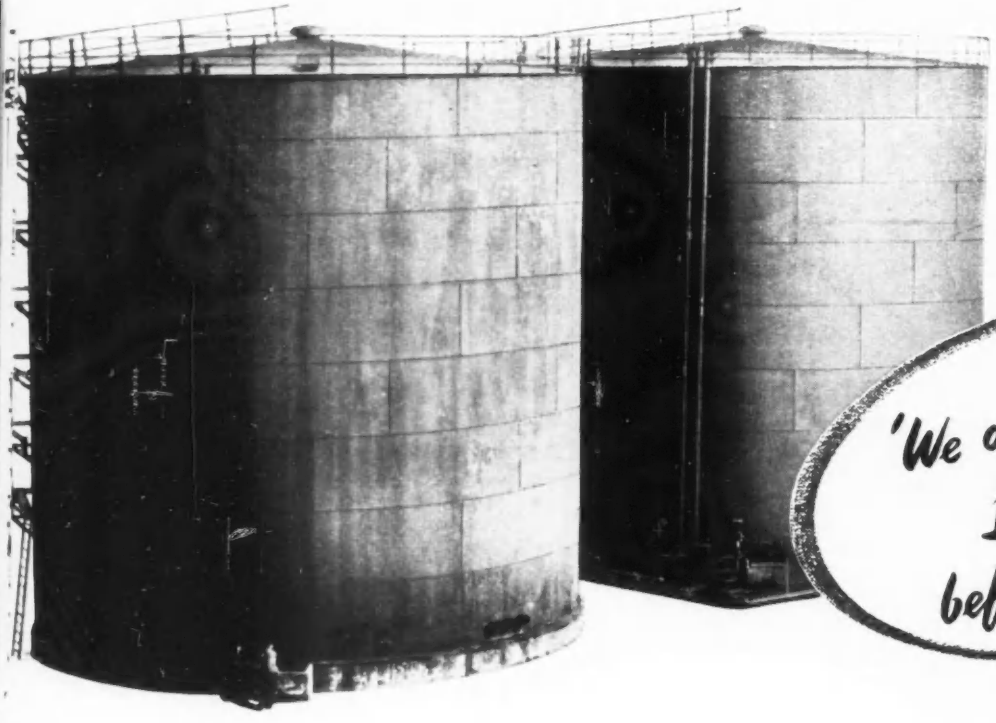

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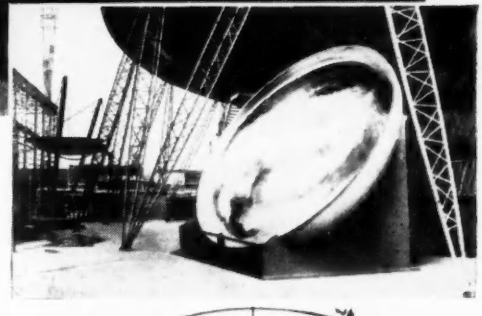

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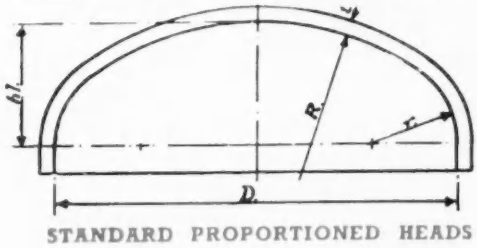


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| 6′ 0″ | 5′ 0″ | 12″ | 18 7/16″ | ½″—4″ |
| 6′ 6″ | 5′ 6″ | 12″ | 19½″ | ½″—4″ |
| 7′ 0″ | 6′ 0″ | 12″ | 20″ | ⅝″—4″ |
| 7′ 6″ | 6′ 6″ | 12″ | 20½″ | ⅝″—4″ |
| 8′ 0″ | 6′ 6″ | 16½″ | 25⅛″ | ¾″—3½″ |
| 8′ 6″ | 7′ 0″ | 16½″ | 26⅛″ | ¾″—3½″ |
| 9′ 0″ | 7′ 6″ | 16½″ | 27″ | ¾″—3½″ |
| 9′ 6″ | 7′ 6″ | 16½″ | 28⅛″ | ¾″—3½″ |
| 10′ 0″ | 8′ 0″ | 16½″ | 29 9/16″ | ⅞″—3″ |
| 10′ 6″ | 8′ 0″ | 23″ | 35″ | ⅞″—3″ |
| 11′ 0″ | 9′ 0″ | 23″ | 34⅛″ | ⅞″—2½″ |
| 11′ 6″ | 10′ 0″ | 23″ | 34 7/16″ | ⅞″—2½″ |
| 12′ 0″ | 11′ 0″ | 23″ | 34⅛″ | ⅞″—2″ |
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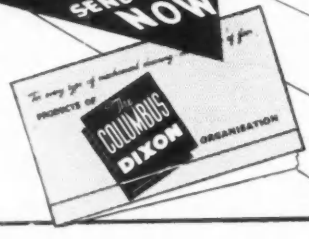


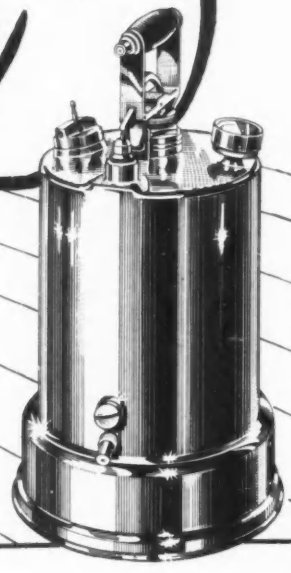

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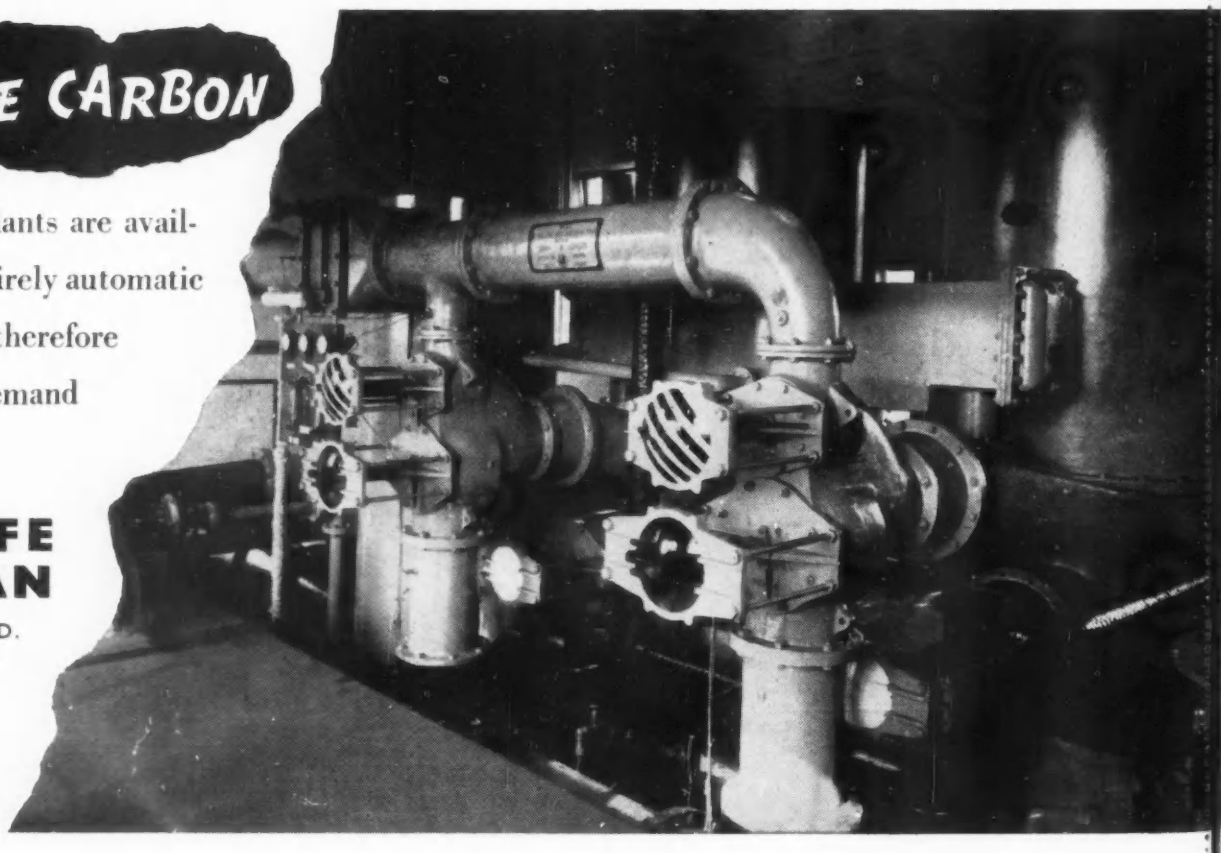

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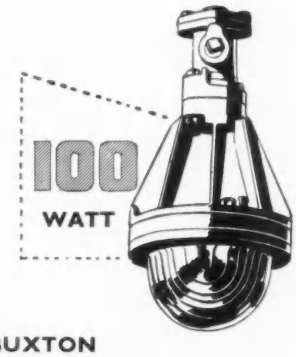


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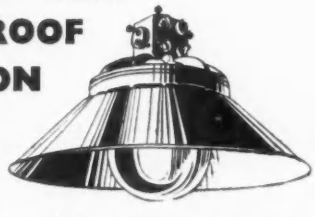

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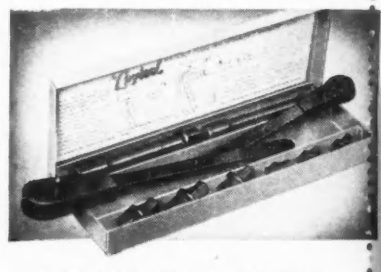

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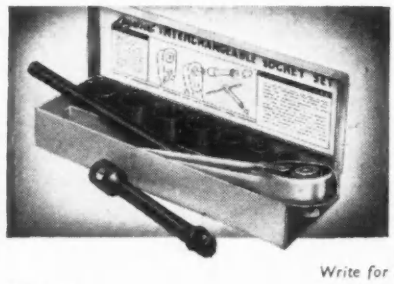

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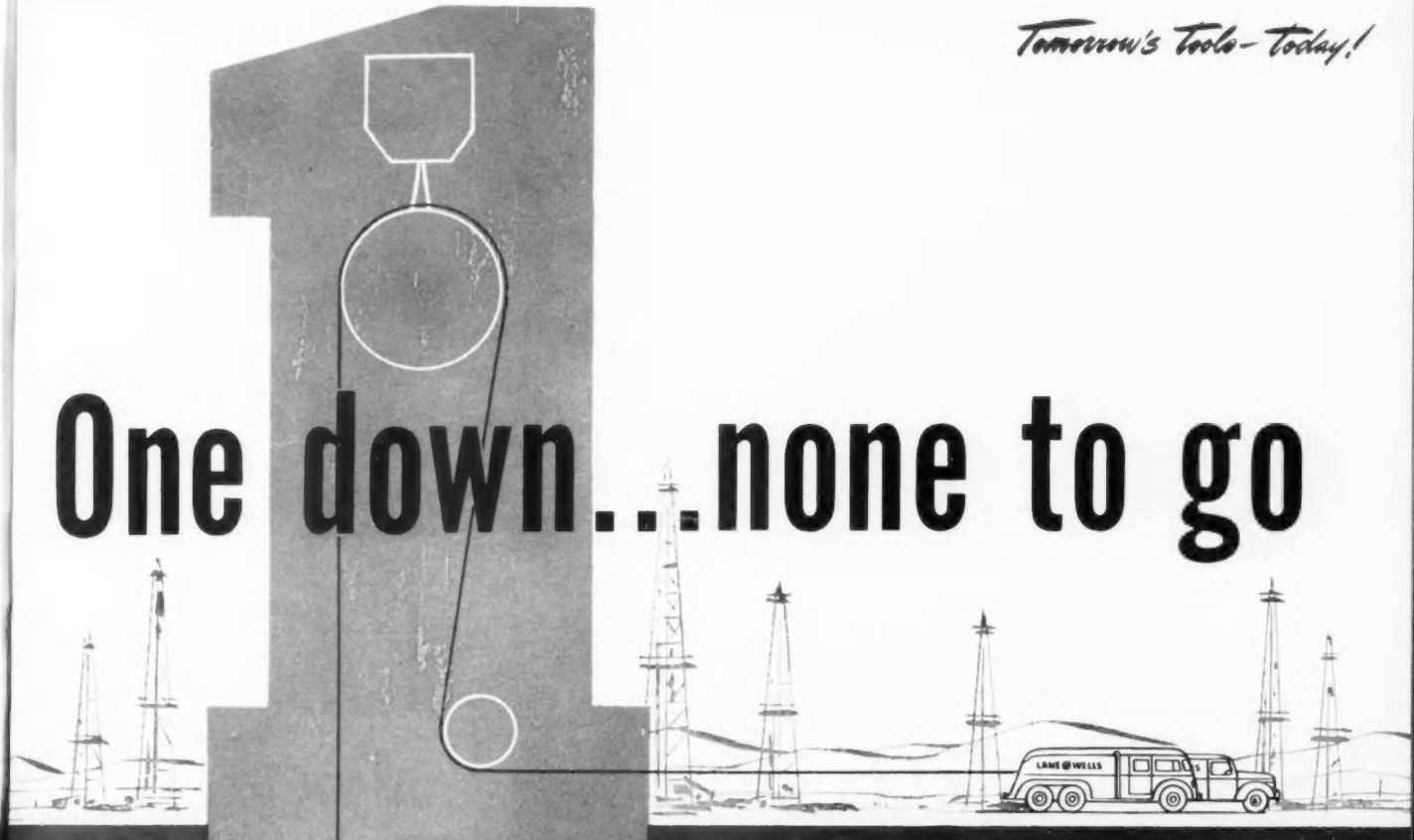


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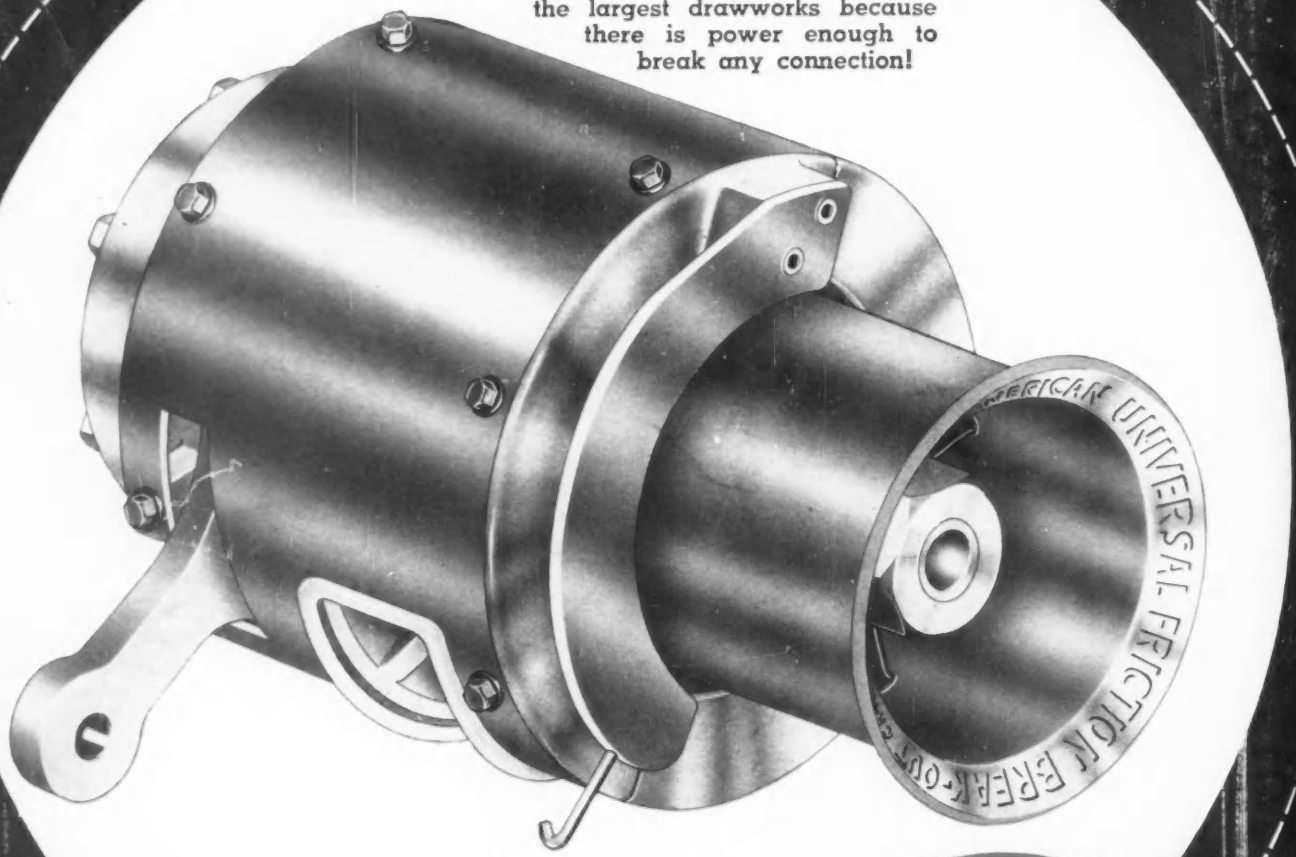


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